WA 000206-2
11/12/08

All, Known, Available, and Reasonable Methods of Treatment Study

PUGET SOUND NAVAL SHIPYARD AND INTERMEDIATE MAINTENANCE FACILITY
BREMERTON WASHINGTON

NOVEMBER 2008

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PUGET SOUND NAVAL SHIPYARD & INTERMEDIATE MAINTENANCE FACILITY

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Executive Summary

Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNS&IMF) holds National Pollutant Discharge Elimination System (NPDES) permit WA-00206-2 issued by the Environmental Protection Agency (EPA). The permit authorizes PSNS&IMF to discharge stormwater, non-contact cooling water, groundwater, and treated industrial wastewater into Sinclair Inlet. The EPA is currently working with PSNS&IMF and the Washington State Department of Ecology (Ecology) to renew the NPDES permit. A requirement of the renewal process is that PSNS&IMF conduct an All Known, Available, and Reasonable Methods of Treatment (AKART) Study. AKART is a Clean Water Act (though defined by Ecology) concept that represents the most current methods of preventing, controlling, or abating the pollutants associated with a discharge that can be installed or used at a reasonable cost.

A related driver for PSNS&IMF to conduct the AKART Study is allowance of effluent mixing zones. Permit limits derived when mixing is allowed will help enhance/maintain the NPDES compliance posture of PSNS&IMF.

An important concept in the application of AKART methodology in this study is that "AKART has been interpreted as a technology-based approach to limiting pollutants from wastewater discharges" (Ecology 2006a). In this technology-based approach, the ultimate water quality impacts from the discharge are not a direct consideration (i.e., not a component of the AKART Study) in determining AKART.

The primary goal of the study was to answer the question: What is the AKART standard for specific PSNS&IMF facilities and practices (i.e., Are they known, available, and reasonable methods of treatment)? Facilities/practices that do not meet the AKART standard were evaluated to determine what more must be done to reach the AKART standard. The AKART standard was primarily determined by using a similar facility approach with the addition of an economic-reasonableness component where data could be developed in a timely manner.

To help focus the study and bring into consideration potential water quality impacts, pollutants of concern were determined. For the dry docks, these are temperature, copper, and zinc. For non-dry dock stormwater, these are copper, zinc, and Oil & Grease. Facilities/practices that have the potential to discharge pollutants of concern were evaluated with regard to the AKART standard.

The following facilities/practices were found to not meet the AKART standard and therefore will require upgrade/modification:

- Non-Dry Dock Stormwater: The non-dry dock industrial areas of PSNS&IMF were evaluated to determine which areas did not achieve the AKART Standard. These so called focus areas are identified below along with the proposed upgrade/modification.
    - Dry Dock 3 Outdoor Cutting Pad: This facility is located adjacent to Dry Dock 3. A roof/cover capable of preventing stormwater from contacting this process will be placed over this pad to achieve the AKART standard.
    - Dry Dock 3 Metal Sorting Area: This triangular area is located north of the cutting facility noted above. A sump with a level indicator will be constructed in this area to collect any stormwater. The stormwater will be removed and discharged to the sanitary sewer or to the Dry Dock 3 Process Water Collection System as necessary. PSNS&IMF is also evaluating the possibility of moving this operation entirely undercover eliminate exposure to stormwater.
    - Vehicle and Equipment Maintenance – Building 455: Vehicles and equipment awaiting maintenance are staged adjacent to Building 455, located north of Dry Dock 6. The

selected AKART option is to install an oil/water separator and route the discharge into the sanitary sewer.

- Crane Maintenance Pad: Crane maintenance is primarily conducted on the east side of building 450 (north of Dry Dock 6) on a concrete pad with an oil/water separator. The selected AKART option is to install a follow-on advanced stormwater treatment device.
- Recycle Materials Transfer Site: This facility is located northeast of Dry Dock 6 and is a collection point for scrap metals from the PSNS&IMF recycle program. As currently configured, a portion of stormwater runoff from the site is directed to a stormwater treatment system; the rest, however, goes into standard catch basins. PSNS&IMF was aware of the shortcomings of this facility prior to development of the AKART Study, and a design is complete for making needed modifications. Construction completion is scheduled prior to the end of 200X.

- Best Management Practices (BMPs): The AKART Study evaluated existing conventional BMPs with regard to AKART and has substantially revised most BMPs and added many new ones. A very significant proposed change is only allowing spray painting of anti-fouling paints in enclosed, covered areas.

An additional component of the Study was to evaluate what more could be done even if a facility/practice achieved the AKART standard. The following were identified:

- Dry Dock Stormwater: Significant upgrades are planned for the dry dock stormwater management system (Process Water Collection Systems (PWCS)). These include:
  - Replacing existing oily water treatment systems (OWTS) units with high capacity ones.
  - Install piping for connecting the PWCS to the OWTS and existing tanks.
  - Sanitary sewer system upgrades for added PWCS reliability and capacity.

  Note: The PWCS upgrade project has an estimated cost of approximately $21,000,000. It is important to note that new constitution on Federal facilities above $750,000 requires approval from congress and must appear in the Federal budget. While PSNS&IMF will make every effort to gain Navy and the Congressional approval for this project success cannot be guaranteed.
- Steam Plant: Concurrently with the AKART Study, PSNS&IMF is in the process of changing from demineralization, the current boiler feedwater treatment method, to reverse-osmosis (RO). This change will eliminate the use of corrosive chemicals that are now used to regenerate the demineralizers. The wastestream from RO (reject water) is of a higher quality than from demineralization. As part of the RO project, boiler blowdown along with facility industrial drains will be redirected to the sanitary sewer. These are currently treated and discharged via Outfall 021. Redirection of the blowdown will eliminate the primary Outfall 021 heat energy source. Overall, these changes will result in a higher quality effluent discharge from Outfall 021 and constitutes AKART.
- Vessel in Dry Dock Cooling Water Reduction: PSNS&IMF is pursuing two cooling water reduction initiatives:
  - The first initiative is to determine if cooling water flow rates can be reduced. If feasible and if approval is granted, PSNS&IMF will implement this initiative.
  - The second initiative is to study the replacement of low-flow once through non-contact cooling water with chillers. PSNS&IMF is studying the feasibility of using small chillers for heat exchangers with non-contact cooling water flows of 150 gpm or less.

Acronyms and Abbreviations

AKART	All, Known, Available, and Reasonable Methods of Treatment
API	American Petroleum Institute
BAT	Best Available Technology Economically Achievable
BMP	Best Management Practice
BNC	Bremerton Naval Complex
C	Celsius
Cascade	Cascade General Portland Shipyard
CBIs	Catch Basin Inserts
cfm	Cubic feet per minute
Code 106	PSNS&IMF Environment, Safety, and Health Office
CP	Coalescing Plate
Cu	Copper
DD	Dry Dock
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
F	Fahrenheit
FY	Fiscal Year
gpm	gallons per minute
HRC	High Rate Clarification
IEI	Interface Engineering Instruction
IPI	Industrial Process Instruction
µg/l	micrograms per liter
mg/l	milligrams per liter
MGD	Million Gallons per Day
MP&M	Metal Products and Machinery
MSGP	Multi-Sector General Permit
n	number of records in a dataset
NASSCO	National Steel and Shipbuilding Company
NBK	Naval Base Kitsap
ND	Not-Detected or Non-Detect
NPDES	National Pollutant Discharge Elimination System
NSPS	New Source Performance Standards
NTU	Nephelometric Turbidity Unit
O&G	Oil and Grease
OHS	Oil and Hazardous Substances
OU B	Operable Unit B
OWTS	Oily Water Treatment System
PI	Shipyard Process Instruction
POLs	Petroleum, Oils, and Lubricants
POTW	Publicly Owned Treatment Works
PSNS&IMF	Puget Sound Naval Shipyard and Intermediate Maintenance Facility
PVC	Poly Vinyl Chloride
PWCS	Process Water Collection System
RTMS	Recycle Materials Transfer Site
SWDP	State Waste Discharge Permit
Todd	Todd Pacific Shipyards Corporation
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids

UIPI	Uniform Industrial Process Instructions
WDOE	Washington State Department of Ecology
WDP	Working Draft Permit
WET	Whole Effluent Toxicity

Certificate of Engineer

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

Matthew Jabloner, P.E.

1 Background

PSNS&IMF and Naval Base Kitsap (NBK) Bremerton are located on the Kitsap peninsula on the north side of Sinclair Inlet of Puget Sound. The two installations[1] are contiguous and together form one 354-acre facility that is surrounded by the City of Bremerton, located in Kitsap County, Washington. PSNS&IMF is located to the south and east of the facility, and the support area, NBK Bremerton, is located to the north and west. The facility is heavily developed (industrial and urban). PSNS&IMF functions occur in approximately 208[2] acres; PSNS&IMF conducts traditional naval shipyard type work. It is one of the State's largest industrial installations employing about 10,000 people. The NBK Bremerton area has housing, recreational, and commercial services/facilities. Figure 1 is a Vicinity and Site Plan map.

Congress purchased the land for what now is called PSNS&IMF and NBK Bremerton in 1891 for construction of a dry dock, repair, and overhaul base for the U.S. Navy. In 1896 the first dry dock along with associated facilities (barracks/housing and administrative) was completed. The Navy has built up the facility over time as the need arose and the process continues to this day. Table 1-1 notes when the dry docks were originally constructed.

Table 1-1: Dry Dock Details

Dry Dock #	Year Constructed	Floor Area (acre)
1	1896	1.58
2	1913	2.87
3	1919	2.75
4	1941	3.40
5	1943	3.49
6	1962	5.14
TOTAL		19.23

PSNS&IMF's current mission of "one team ensuring freedom by fixing ships and supporting the war fighter" has changed little throughout the history of the facility. PSNS&IMF is focused on providing customers with quality, timely and cost efficient maintenance, modernization, and technical and logistics support.

Major facilities include six dry docks and nine piers. Operational facilities include: shops (machine, marine, welder, forge, paint, riggers, pipe, equipment maintenance, ship fitter, woodworking, sheet metal), metal preparation, hazardous waste storage, chemical/materials laboratory, crane test and maintenance, railroad maintenance, materials and equipment storage, public works related (including utilities), and vessel nuclear propulsion associated facilities.

Weather patterns are typically driven by western Washington's heavily marine influenced climate. Average annual total rainfall is 51.73 inches with almost 50% occurring in November, December, and January. July has the lowest average rainfall. Snowfall is minimal with a total annual average of 7.6 inches. On average January has the highest monthly snowfall. (http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wabrem)

[1] The combined facility of PSNS&IMF and NBK Bremerton is also referred to as the Bremerton Naval Complex (BNC).
[2] Area estimate includes all six dry docks, which is approximately 19 acres, but not wharfs. See Figure 1.

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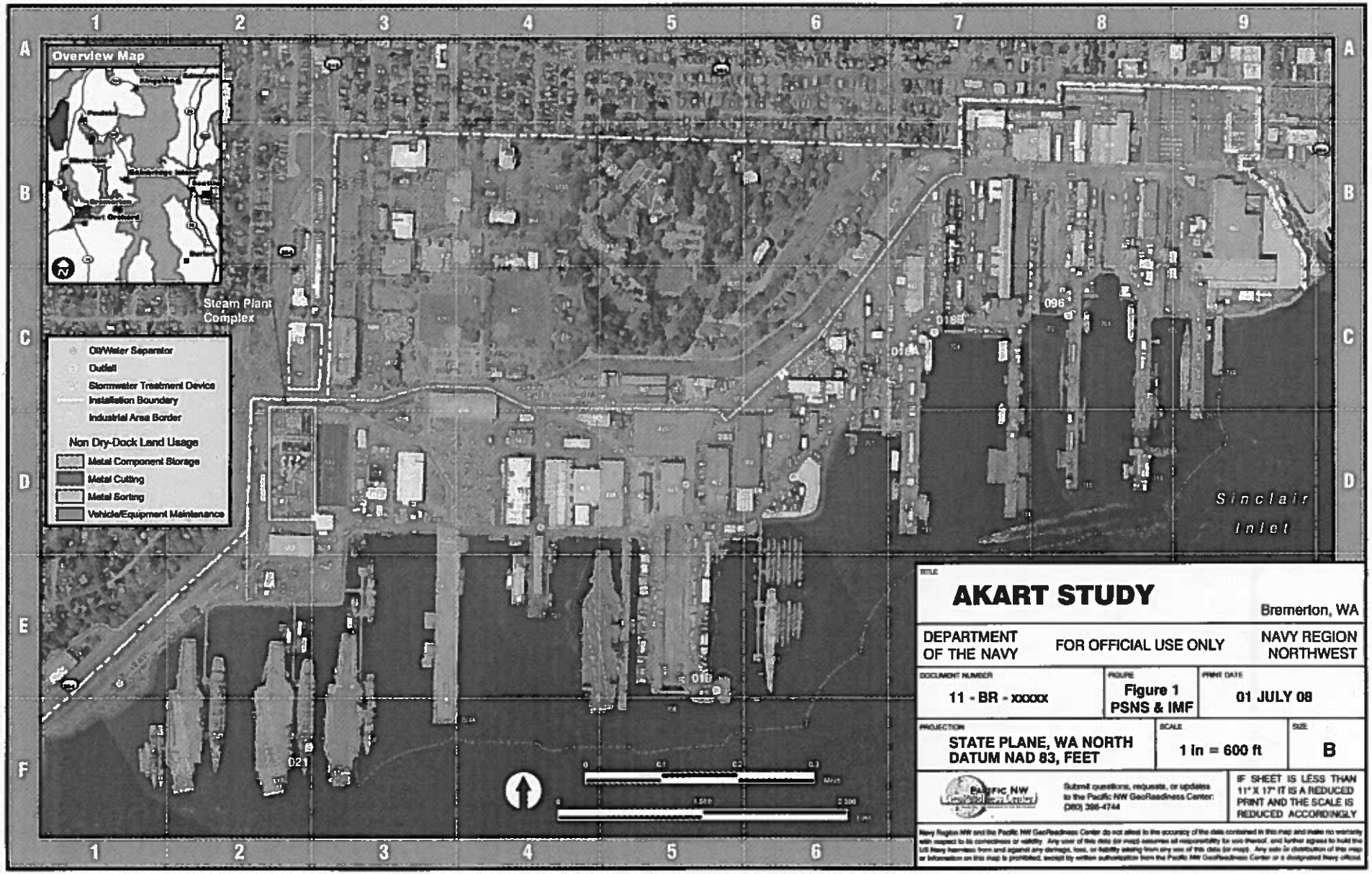
Figure 1: Vicinity and Site Plan Map



AKART STUDY

Bremerton, WA

DEPARTMENT OF THE NAVY	FOR OFFICIAL USE ONLY	NAVY REGION NORTHWEST

DOCUMENT NUMBER	FIGURE	PRINT DATE
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PROJECTION	SCALE	SIZE
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2 Regulatory Context

PSNS&IMF holds National Pollutant Discharge Elimination System (NPDES) permit WA-00206-2 issued by the Environmental Protection Agency (EPA) with an effective date of 1 April 1994. The permit is included as Attachment 1. The permit authorizes PSNS&IMF to discharge stormwater, groundwater, non-contact cooling water, and treated industrial wastewater into Sinclair Inlet. The term of the permit is five years but it has been administratively extended by the EPA. The EPA is currently working with PSNS&IMF and the Washington State Department of Ecology (Ecology) to renew the NPDES permit. Section 401 of the Federal Clean Water Act requires a water quality certification from the State of Washington (with Ecology being the issuing agency) prior to EPA issuance of the renewed NPDES permit. The certification conveys Ecology's determination that the discharges authorized per the NPDES permit are in accordance with Washington State Water Quality Standards, WAC 173-201A. A component of the certification will require PSNS&IMF to conduct an All Known, Available, and Reasonable Methods of Treatment (AKART) Study. AKART is an Ecology concept that represents the most current methods of preventing, controlling, or abating the pollutants associated with a discharge that can be installed or used at a reasonable cost. The EPA will incorporate the AKART Study requirement, per the certification, as a condition of the renewed NPDES permit. Conducting an AKART Study is a first step in the process of applying AKART to a facility.

A related driver for PSNS&IMF to conduct the AKART Study is allowance of effluent mixing zones. Per WAC 173-201A-400, Mixing Zones, "a discharger shall be required to fully apply AKART prior to being authorized a mixing zone." Permit limits derived when mixing is allowed will help enhance/maintain the NPDES compliance posture of PSNS&IMF.

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3 Scope of Study

This site-specific AKART Study will focus on industrial areas/operations of PSNS&IMF directly associated with shore-based vessel maintenance, overhaul, and recycling. Overall, the geographic focus is the Figure 1 defined 208-acre Industrial Area[3], which includes the dry docks. Non-industrial areas, primarily NBK Bremerton, are not addressed. Therefore the primary focus of this study is stormwater associated with operational dry docks and non-dry dock PSNS&IMF areas engaged in vessel maintenance, overhaul, and recycling operations. NPDES Outfall 021, the outfall associated with the Steam Plant (facility number 900), is included in the study at the request of EPA and Ecology. It is not directly associated with vessel maintenance, overhaul, and recycling operations.

The scope of the study was determined in discussions between the Navy, EPA, and Ecology and formalized in the AKART Study Work Plan (NAVFAC Northwest 2007).

[3] The AKART Study defined industrial area as show in Figure 1 is specific to this study. The AKART industrial area includes the commonly defined area known as the Controlled Industrial Area (CIA) with additional areas on the west end of PSNS&IMF.

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4 Application of AKART to PSNS&IMF and Study Approach

AKART is an Ecology concept that represents the most current methods of preventing, controlling, or abating the pollutants associated with a discharge that can be installed or used at a reasonable cost. Important in the application of AKART methodology and conceptually in this study is that "AKART has been interpreted as a technology-based approach to limiting pollutants from wastewater discharges." (Ecology 2006a) In this technology-based approach, the ultimate water quality impacts from the discharge are not a direct consideration (i.e., not a component of the AKART Study) in determining AKART.

While it is beyond the scope of an AKART Study to address water quality based considerations, this study will make the connection by correlating identified pollutants to specific PSNS&IMF activities/practices/facilities (practices). These are called AKART Study Focus Areas (focus areas). The intent in determining focus areas is, to some degree, relate the AKART technology-based construct to potential water quality impacts. The study's approach and associated logic is outlined below:

- **AKART Study Focus Areas.** The focus areas are determined by: 1) Identifying pollutants of concern, which are those industry or facility-specific parameters deemed important typically due to potential water quality impacts. The intent of determining pollutants of concern is to connect the AKART study process, which is a technology-based construct, with potential water quality impacts. 2) Categorizing PSNS&IMF practices. Similar industrial practices will be grouped for two purposes:
  - To help streamline the study process by focusing on areas or groups of similar practices rather than each one.
  - Potential pollutants will be assigned to each industrial practice and then correlated to the pollutants of concern defined in the above step. The result will be a list of grouped industrial practices, so called focus areas, for follow-on evaluation.
- **Current Pollution Prevention Practices.** Existing practices in use at PSNS&IMF will be described. The information will be used in subsequent sections to help define AKART in part through evaluation with practices used at similar facilities.
- **Effluent Characterization.** Existing PSNS&IMF dry dock and stormwater effluent data will be evaluated. The evaluation will focus on the defined pollutants of concern. Additionally, the characterization will roughly determine the effectiveness of pollution prevention practices over time.
- **Similar Facility Evaluation.** Facilities similar to PSNS&IMF will be evaluated to determine what pollution prevention practices are currently used or may be used in the future. In the final AKART analysis, this information will be used along with the current practices used by PSNS&IMF to help define AKART.
- **AKART Analysis.** The AKART Analysis pulls together prior evaluations for determining which practices are considered AKART, which are not, and what is needed for achieving AKART. For the purposes of the AKART analysis, there are three categories into which a pollution prevention technology or management practice may fall: below, within, and above the AKART range. If the technology/practice employed is too simple or additional or a higher level treatment technology/practice is known, available, and reasonable, the practice/technology is defined as below the AKART range and therefore not AKART. If the technology/practice employed is known, available, and reasonable, it is defined as within the AKART range. If the technology/practice employed or considered is unique, experimental, little used, not reasonably available, and/or not fully validated, it is defined as above the AKART range. This is illustrated in Figure 2.

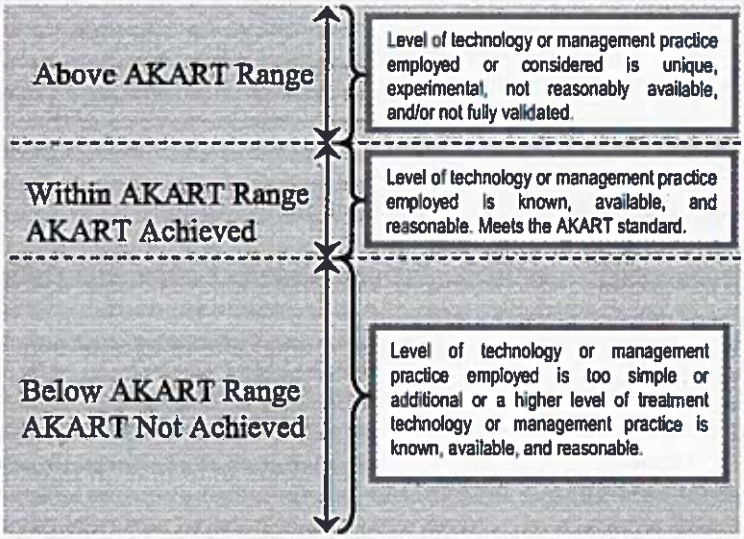

Figure 2: AKART Categories

The following logic was used to help determine the AKART status (below, within, or above) of technologies/practices employed at PSNS&IMF.

- Is the technology/practice:
  - Known
  - Available
  - Reasonable
    - Are the production processes equivalent to similar facilities?
    - Does this facility have some site specific constraints prohibiting increased treatment efficiency?
    - And are the facilities of comparable age?
    - If applicable, is the estimated cost "reasonable"?
  - Will the proposed AKART technology/practice minimize one or all defined pollutants of concern
  - How well is the technology/practice inherently minimizing, eliminating, or controlling potential pollution?
  - What existing technologies/practices are already AKART?
- Per Ecology guidelines, one method of defining AKART for a facility is consideration of the treatment performance of a similar facility or group of similar facilities. "AKART means that effluent limits may be derived in consideration of the treatment performance of a similar facility" (Ecology 2006a). In addition to the "similar facility" approach, AKART can be determined using economic reasonableness tests. For this study, AKART is determined via the "similar facility" approach, with its attendant economic reasonableness evaluation. Below Ecology provides additional guidance in using the similar facility approach to determine AKART (Ecology 2006a).

  An AKART determination may take into consideration the treatment performance at a similar manufacturing facility. In this situation the permit writer must assess the costs to the facility to achieve the increased treatment efficiency. Some of the factors to be analyzed are;

  1. *Are the production processes equivalent?*

2. *Does this facility have some site specific constraints that would prohibit the increased treatment efficiency?*
3. *And are the facilities of comparable age?*

A "weight of evidence" type of approach is used for making the final AKART decision.

Those PSNS&IMF technologies/practices that fall below the AKART range were evaluated to determine how to achieve the AKART standard. The "similar facility" approach was the primary method to determine what was needed to achieve the AKART standard. If needed, a cost effectiveness evaluation was conducted to help vet alternative technologies/practices to pick the best solution that achieves the AKART standard.

For those technologies/practices in use at PSNS&IMF that already meet or exceed the AKART standard, and alternatives technologies/practices are under consideration, economic reasonableness was the primary factor in determining if implementation is justified. Economic reasonableness is broadly defined as a qualitative evaluation of the economics associated with a technology/practice. The evaluation may include ancillary issues such as impacts to Shipyard production, mission, cost, and/or schedule. Table 4-1 summarizes the AKART implementation decision factors.

Table 4-1: AKART Implementation Decision Factors

AKART Range	Primary Decision Factor	Secondary Decision Factor
Below the AKART Range	Similar Facility	Cost Effectiveness
Within the AKART Range	Economic Reasonableness	Similar Facility
Above the AKART Range	Economic Reasonableness	Similar Facility

It could reasonably be interpreted that AKART is focused on treatment systems and specifically on performance measures of those systems. For instance, if a company installs a new assembly line, the focus is on what level and type of treatment would be required to achieve the AKART standard. While this approach may be reasonable for certain industries/types of discharges, it is too narrow of a definition of AKART for shipyards. AKART for the purposes of this study is defined in the broader terms of minimizing pollution through a variety of means, including source control, pollution prevention, process improvement, product substitution, and, of course, treatment technology.

The AKART analysis decision process is summarized in Figure 3.

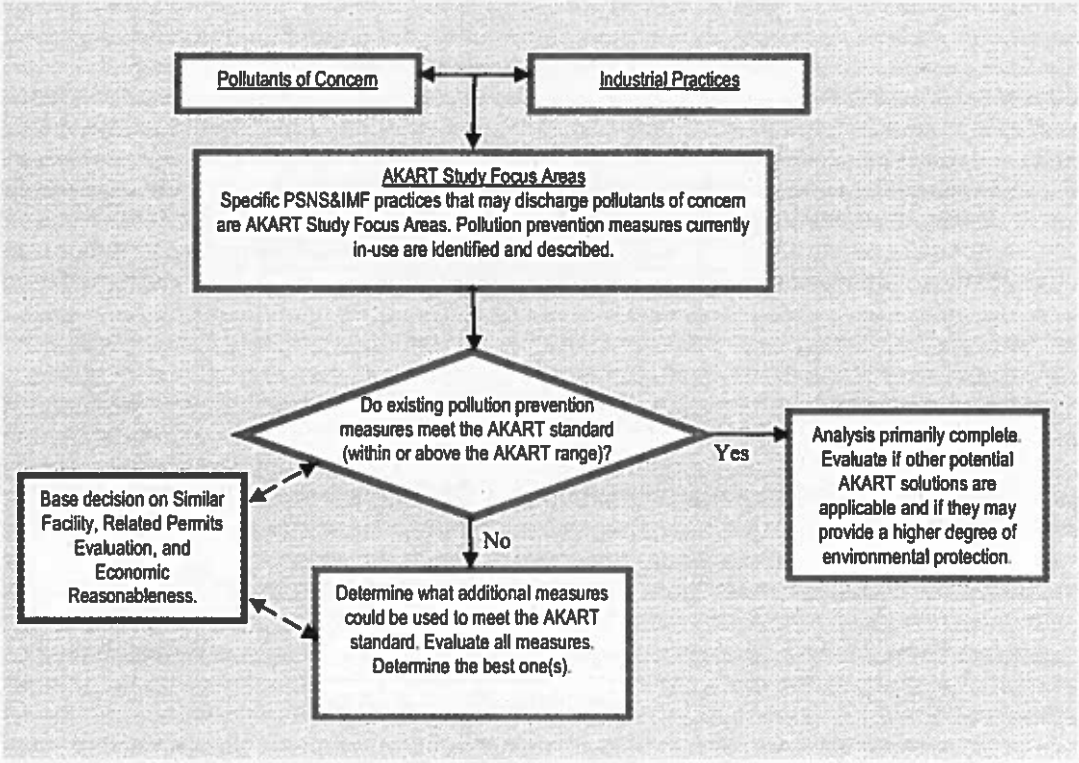

Figure 3: AKART Analysis Decision Process

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5 NPDES Permit

This section describes requirements of the current PSNS&IMF NPDES permit, included as Attachment 1, and the Working Draft NPDES Permit that the EPA provided to PSNS&IMF in May 2008 (EPA 2008).

5.1 Summary of the Current NPDES Permit and Compliance Summary

PSNS&IMF holds NPDES permit WA-000206-2 issued by the EPA. Table 5-1 includes some details of the permit.

Table 5-1: PSNS&IMF Current NPDES Permit Information

Permit Element	Detail
Permit Number	WA-000206-2
Permit Authority	EPA
Effective Date	1 April 1994
Permit Term	5 Years
Expiration Date	Administratively extended by EPA for an indefinite period.
Geographic Coverage	Applies to the whole of PSNS&IMF and NBK Bremerton
Dry Dock Associated Outfalls	096, 018A, 018B, 019
Steam Plant Outfall	021
Monitored Stormwater Outfalls	002, 012, 014, 025, 040, 010, 030, 003, 006, 013, 028, 052, 022

Outfalls 018A, 018B, and 096 discharge dry dock drainage from dry docks 1 through 5 into Sinclair Inlet. The drainage from these dry docks consists primarily of vessel non-contact cooling water and dry dock hydrostatic relief groundwater (groundwater infiltration). Lowering the groundwater table adjacent to the dry docks reduces hydrostatic pressure on the floors and walls to maintain structural integrity. Secondary sources include potable water, marine water (fire protection), stormwater, and steam condensate. The long term average combined outfall flow rate for 018A, 018B, and 096 is 3.30 million gallons per day (MGD). Outfall 019 serves Dry Dock 6 and has similar inputs as dry docks 1 through 5. The long term average Outfall 019 flow rate is 5.30 MGD but exhibits significant variation on a shorter term basis. Outfall 021 has a long term average flow rate of 82,000 gallons per day.

Current and historic monitoring per the permit is addressed in Table 5-2 as well as the history of compliance with current permit limits. Outfall 021, which serves the Steam Plant, is addressed in Section 16.

Table 5-2: PSNS&IMF NPDES Permit Monitoring Summary and Compliance History

Parameter	Currently Monitored	Monitoring Frequency/Note	Compliance Position	Compliance Note
Dry Dock Outfalls: 018A, 018B, 096, and 019				
Flow	Yes	Weekly	NA	
Oil & Grease	Yes	Weekly	Full Compliance	No permit limit exceedances have occurred.
Copper	Yes	Weekly	Reoccurring Exceedances	Copper Concentration: The monthly average permit limit is 19 µg/l. From 2003 to 2007, the limit was exceeded 7 times. The daily maximum limit is 33 µg/l. From 2003 to 2007 the limits was exceeded 16 times. Copper Loading: The monthly average permit limit is 0.44 lbs/day for dry docks 1 through 5 and 0.83 lbs/day for Dry Dock 6. From 2003 to 2007 the limits was exceeded 9 times. The daily maximum limit is 0.77 lbs/day for dry docks 1 thru 5 and 1.44 lbs/day for Dry Dock 6. From 2003 to 2007, the limits were exceeded 23 times.
Lead, Mercury, and Zinc	No	Required monthly for the first year of the permit only.	NA	
Temperature	Yes	Monthly	NA	
PCBs	No	Required monthly for the first year of the permit only.	NA	
Whole Effluent Toxicity Testing	No	Required quarterly for the first year of the permit only.	NA	
Ambient (Surface Water) Monitoring of Sinclair Inlet				
Total Recoverable and Dissolved Copper, Lead, and Zinc	No	Required quarterly for the first year of the permit only.	NA	
Sediment Monitoring of Sinclair Inlet				
General	Yes	Submit "future sediment monitoring conducted as required by Washington Department of Ecology, Toxics Cleanup Program, and EPA's Superfund Program."	NA	
Stormwater Outfalls 002, 012, 014, 025, 040, 010, 030, 003, 006, 013, 028, 052, 0224				
Biochemical Oxygen Demand	No	Required twice a year for the first two years of the permit only. Additionally dry-weather sampling was required once a year for the same period.	NA	
Total Suspended Solids	No	Same as above	NA	
Chemical Oxygen Demand	No	Same as above	NA	
pH	No	Same as above	NA	
Metals: arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, and cyanide	No	Same as above	NA	

[4] Monitored parameters varied by outfall. Please refer to the NPDES permit, Attachment 1, for a breakdown of which parameters are associated with which outfalls.

Table 5-2: PSNS&IMF NPDES Permit Monitoring Summary and Compliance History

Parameter	Currently Monitored	Monitoring Frequency/Note	Compliance Position	Compliance Note
Total Petroleum Hydrocarbons	No	Same as above	NA	
Semi-Volatile Organics	No	Same as above	NA	

5.2 Summary of the Working Draft Permit

EPA provided PSNS&IMF with the Working Draft Permit in May 2008 to give an indication of how the final NPDES renewed permit might look. The Working Draft Permit has no official regulatory or procedural context. Changes to the permit will be made during the process as it goes to public draft and then final. Along with the Working Draft Permit, EPA provided a Working Draft Permit Fact Sheet. Table 5-3 is a summary of the Working Draft Permit.

Table 5-3: PSNS&IMF Working Draft NPDES Permit Information

Permit Element	Detail
Permit Number	WA-000206-2
Permit Authority	EPA
Effective Date	Not yet determined
Permit Term	5 Years
Expiration Date	Not yet determined
Geographic Coverage	Fact Sheet notes the permit addresses for only PSNS&IMF and not NBK Bremerton. The Steam Plant (Outfall 021) is an NBK Bremerton facility however; it is included in the permit.
Dry Dock Associated Outfalls	096, 018A, 018B, 019, AAA, BBB
Steam Plant Outfall	021
Monitored Stormwater Outfalls	001, 002, 003, 006, 008, 010, 012, 013, 014, 015, 022, 023, 025, 028, 030, 040, 052, 089, 095

Table 5-4 outlines monitoring requirements per the Working Draft Permit and provides a general indication of the expected level of compliance with those limits. Outfall 021, Steam Plant, is addressed in Section 16. Past monitoring data, when available, was used to make the determination. For example, PSNS&IMF has a significant outfall temperature dataset. Reviewing this data showed that Dry Dock 6 (Outfall 019) would only rarely exceed the 16°C limit. For dry docks 1 through 5 (Outfalls 018A, 018B, and 096) this is not the case and the limit would be exceeded during the summer months.

Table 5-4 also provides an indication of compliance based on past data and therefore relates to those practices in effect at the time the data was obtained. Table 5-4 does not make any assumptions about permit compliance as related to changes in practices that may be undertaken, such as new BMPs.

To relay the level of expected compliance, Table 5-4 uses the following terms:

- No Exceedances – There is no expectation that the permit limit would be exceeded.
- Regular Exceedances – The permit limit will be exceeded on a regular basis. For example, PSNS&IMF would expect to exceed the dry dock copper limit in the Working Draft Permit on a weekly basis.
- Possible Exceedances – Monitoring data is limited making a more definitive compliance determination impossible. However, there is some indication that compliance is in question.
- Exceedances Unlikely - Monitoring data indicates that exceedances are possible but unlikely, or they may occur infrequently.
- Unknown – There is not enough information to make a compliance determination.

Table 5-4: PSNS&IMF NPDES Working Draft Permit Monitoring Summary and Estimated Compliance Position

Parameter	Associated Permit Limit?	Monitoring Frequency/Note	Estimated Compliance Position	Compliance Note
Dry Dock Outfalls: 018A, 018B, 096, and 019, AAA, BBB				
Flow	No	Not addressed (assumed continuous recording)	NA	
Copper	Yes	Weekly	Regular Exceedances	The final average monthly permit limit is 2.5 µg/l. The final maximum daily limit is 5.8 µg/l. Historic copper outfall data can not be used to estimate compliance with the noted limits since the PSNS&IMF quantification level is 10 µg/l. Based on history with current limits, however, the limits in the Working Draft Permit would be exceeded on a regular basis.
Lead	Yes	Weekly	Unknown	The final average monthly permit limit is 7 µg/l. The final maximum daily limit is 14 µg/l. Existing data is limited making a reliable estimate of compliance with the noted limits not possible.
Mercury	Yes	Weekly	Unknown	The final average monthly permit limit is 0.024 µg/l. The final maximum daily limit is 0.048 µg/l. Existing data is limited, making a reliable estimate of compliance with the noted limits is not possible.
Zinc	Yes	Weekly	Unknown	The final average monthly permit limit is 47 µg/l. The final maximum daily limit is 95 µg/l. Existing data is limited making a reliable estimate of compliance with the noted limits not possible.
Arsenic	Yes	Weekly	Unknown	The final average monthly permit limit is 0.16 µg/l. The final maximum daily limit is 0.23 µg/l. Derivation of the arsenic permit limits are in question. PSNS&IMF is working with EPA on the matter.
Temperature	Yes	Daily	Regular Exceedances	The maximum daily limit is 16° C. A review of historic temperature data[5] indicates that, for outfalls 018A, 018B, and 096, the noted limit would be exceeded frequently in July, August, and the first half of September. For Outfall 019 one weekly sample resulted in a value over the noted limit.
Oil & Grease	Yes	Monthly	No Exceedances	The final average monthly permit limit is 10 mg/l. The final maximum daily limit is 15 mg/l. These are the same as current limits. Since there have been no exceedances of the limits in the past there is no expectation of exceeding them in the future.
Oily Sheen	Yes	Monthly	No Exceedances	The limit is "no visible sheen." This limit is similar to that in the existing NPDES permit, which states: "There shall be no discharge of…oily wastes which produce a sheen on the surface of the receiving water." No exceedances of the permit limit are expected.
Total Residual Chlorine	Yes	Weekly	Unknown	The final average monthly permit limit is 6.1 µg/l. The final maximum daily limit is 12 µg/l. There is no historic total residual chlorine data to estimate compliance with the noted limits. Potable water, however; in the form of freeze protection water, eye wash stations, water piping leaks, and fire-watch water, is an authorized discharge. Since chlorine is a component of potable water, the combined effluent will contain some residual chlorine. Rough calculations indicate that the contribution of chlorine from potable water could exceed the noted limits.
Turbidity	Yes	Monthly	Unknown	The permit limit is "5 NTU (nephelometric turbidity units) above background." PSNS&IMF has no historic outfall turbidity data to estimate compliance with the noted limit. Additionally even if data were available, the limit "floats" based on background. Presumably, background refers to Sinclair Inlet, which has varying turbidity levels depending on depth, intra-waterbody location, season, tide, and environmental inputs (such as wind, storm events, solar input). These factors would make it difficult to define "background" even if data was available.
Tributyltin	No	Monthly	NA	
Priority Pollutants	No	Annually	NA	
Acute Whole Effluent Toxicity	No	Quarterly for one year	NA	

[5] The period of record was 1/4/2007 to 9/9/2008.

Table 5-4: PSNS&IMF NPDES Working Draft Permit Monitoring Summary and Estimated Compliance Position

Parameter	Associated Permit Limit?	Monitoring Frequency/Note	Estimated Compliance Position	Compliance Note
Chronic Whole Effluent Toxicity	No	Quarterly for one year	NA	
Dry Dock Floor Drainage (Process Water Collection System)				
Flow	No	Continuous	NA	
Copper	No	Weekly	NA	Permit includes benchmark value.
Lead	No	Weekly	NA	Permit includes benchmark value.
Mercury	No	Weekly	NA	
Zinc	No	Weekly	NA	Permit includes benchmark value.
Arsenic	No	Weekly	NA	
Oil & Grease	No	Weekly	NA	Permit includes benchmark value.
pH		Weekly	NA	Permit includes benchmark value.
Turbidity	No	Weekly	NA	Permit includes benchmark value.
Total Suspended Solids	No	Weekly	NA	Permit includes benchmark value.
Non-Dry Dock Stormwater (see Table 5-3)				
Copper	Yes	Quarterly	Regular Exceedances	The final maximum daily permit limit is 5.8 µg/l. Section 8.0 evaluates existing stormwater monitoring data. The overall conclusion is that the mean concentration of copper in stormwater is 63 µg/l. Regular exceedances of the noted limit will occur.
Lead	Yes	Quarterly	Exceedances Unlikely	The final maximum daily permit limit is 221 µg/l. The most recent stormwater monitoring results (J. Brandenberger 2007) indicates a maximum value of 410 µg/l and a 75th percentile value of 14 µg/l. Exceedances are unlikely.
Mercury	Yes	Quarterly	Exceedances Unlikely	The final maximum daily permit limit is 2.1 µg/l. Monitoring done as part of the current permit showed levels as high as 13 µg/l but overall levels were less than 1.0 µg/l. Exceedances are unlikely.
Zinc	Yes	Quarterly	Regular Exceedances	The final maximum daily permit limit is 95 µg/l. Section 8.0 evaluates existing stormwater monitoring data concluding that the mean concentration of zinc in stormwater is 149 µg/l. This is above the noted limit and regular exceedances would be expected.
Arsenic	Yes	Quarterly	Exceedances Unlikely	The final maximum daily permit limit is 69 µg/l. Monitoring done as part of the current permit showed levels as high as 140 µg/l but overall levels were in the 10 µg/l range. Exceedances are unlikely.
Total Suspended Solids	No	Quarterly	NA	
Oil and Grease	No	Quarterly	NA	
Oily Sheen	Yes	Quarterly	Exceedances Unlikely	PSNS&IMF would respond to a significant sheen and clean it up.
Turbidity	Yes	Quarterly	Unknown	See discussion above regarding turbidity for the discharge from the dry docks.
Fecal Coliform	No	Quarterly	NA	

Table 5-4: PSNS&IMF NPDES Working Draft Permit Monitoring Summary and Estimated Compliance Position

Parameter	Associated Permit Limit?	Monitoring Frequency/Note	Estimated Compliance Position	Compliance Note
Ambient (Surface Water) Monitoring of Sinclair Inlet				
Copper	No	Surface water monitoring required at two stations in Sinclair Inlet on a quarterly basis. Samples are grab samples.	NA	
Lead	No		NA	
Mercury	No		NA	
Zinc	No		NA	
Arsenic	No		NA	
Oil & Grease	No		NA	
Total Suspended Solids	No		NA	
Turbidity	No		NA	
Salinity	No		NA	
Temperature	No		NA	
Sediment Monitoring of Sinclair Inlet				
The Working Draft Permit does not require sediment monitoring.				

6 AKART Study Focus Areas

This section, using a multi-step process, identifies industrial practices that have the potential to impact water quality. These areas are termed focus areas and are determined by:

1) Identifying pollutants generally associated with shipyards.

2) Determining a subset of the generally identified pollutants related to PSNS&IMF. These are termed pollutants of concern.

3) Correlating PSNS&IMF industrial practices with pollutants of concern to determine focus areas.

6.1 Pollutants of Concern

This section identifies pollutants of concern associated with dry docks and stormwater (non-dry dock associated) discharges. Outfall 021 has separate pollutants of concern evaluated in Section 16.

Pollutants of concern were determined using a two-tiered approach. The first was to determine candidate pollutants of concern based on:

- Site-specific permit limited parameters: In this case, if it is limited in the PSNS&IMF NPDES permit, State Waste Discharge (SWDP) Permit, or Working Draft Permit.
- The parameter is generally associated with shipyards.
    - This may be determined via a literature search and/or
    - Non site-specific permits such as general permits.

The Ecology Boatyard Study (Ecology 2006) states: "... boatyard–related chemicals with the greatest potential for adverse effects in the receiving waters are copper, zinc, lead, tributyltin, polyaromatic hydrocarbons (PAHs), and phthalate plasticizers." Tributyltin is not and has not been used at PSNS&IMF and therefore not a candidate pollutant of concern. PSNS&IMF does not plan on using nor encountering tributyltin paints in maintenance work in the future. Copper, zinc, lead, PAHs, and phthalates are candidate pollutants of concern.

The general permits selected were the Washington State Boatyard General Permit (Ecology 2005) and EPA's Multi-Sector General Permit (MSGP) (EPA 2000). The Boatyard General Permit limits the following parameters in stormwater: copper, Oil & Grease, and total suspended solids (TSS)[6]. The MSGP includes benchmark levels depending on the appropriate industrial sector. Three sectors were considered:

- **Sector N – Scrap Recycling and Waste Facilities.** A significant business line at PSNS&IMF is recycling of vessels. The applicability of this sector to PSNS&IMF is partial since Sector N typically applies to automobile wrecking yards and facilities that receive waste materials. It is however, a reasonable source to help identify candidate pollutants of concern.
- **Sector Q – Water Transportation.** This sector applies to establishments engaged in freight and passenger transportation and certain incidental related services. Applicability to PSNS&IMF is partial but it is a reasonable source to help identify candidate pollutants of concern.
- **Sector R – Ship and Boat Building or Repair Yards.** Applicability to PSNS&IMF is clear. Stormwater monitoring is not required for this sector.

[6] The Boatyard General Permit sets benchmarks for the noted parameter when discharging stormwater into surface waters.

The PSNS&IMF NPDES permit limits copper and Oil & Grease. These are both candidate pollutants of concern.

In the Working Draft Permit the EPA identified pollutants based upon sampling data submitted by PSNS&IMF in the permit renewal application. Those pollutants identified in the Working Draft Permit are herein evaluated to determine if they are AKART pollutants of concern. It will be noted in the PSNS&IMF permit review comments that arsenic and mercury are not valid pollutants of concern. Arsenic was added due to a mathematical error, and mercury is not used in any current industrial processes at PSNS&IMF. Due to nuclear work, PSNS & IMF is a mercury-free area, (with the exception of florescent light ballasts). Only one sample found mercury, and that is attributable to mercury in the sediment of Sinclair Inlet that gets entrained in the dry dock tunnel system with each flooding of the dry dock.

PSNS&IMF holds SWDP ST-7374 issued by Ecology. The permit regulates industrial and semi-industrial discharges of wastewater into the sanitary sewer. Sanitary sewage, including industrial discharges, is routed to the City of Bremerton for treatment. The City discharges effluent into Sinclair Inlet. Similar to NPDES permit limits, SWDP permit limits are based, in part,[7] on water-quality impacts or technology-based considerations. Ecology designated SWDP sample point numbers 113 through 118 limit dry dock stormwater discharges into the sanitary sewer for chromium, copper, lead, and zinc and requires quarterly monitoring. The discharge into the sewer is physically "managed" by the PWCS[8]. Since the SWDP regulates discharges of dry dock stormwater and the limits are associated with water quality and technology, the SWDP is a resource to help identify pollutants of concern.

Table 6-1 identifies candidate pollutants of concerns. Below the table are notes about the sources of information/data used in the table. If a parameter showed up more then once it was deemed a candidate pollutant of concern.

Table 6-1: Candidate Pollutants of Concern

Reference Permit	Temperature	Aluminum	Copper	Chromium	Iron	Lead	Nickel	Zinc	COD	O&G	PAHs	Phthalates	TSS
PSNS&IMF Current NPDES Permit Limited	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐
PSNS&IMF NPDES Working Draft Permit[9] Limited	☒	☐	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐
PSNS&IMF SWDP Permit Limited	☐	☐	☒	☒	☐	☒	☒	☒	☐	☐	☐	☐	☐
Pearl Harbor Naval Shipyard	☒	☐	☒	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐
Ecology Boatyard Study	☐	☐	☒	☐	☐	☒	☐	☒	☐	☐	☒	☒	☐
Boatyard General Permit	☐	☐	☒	☐	☐	☐	☐	☐	☐	☒	☐	☐	☒

[7] Other considerations would be worker health and safety, sludge quality, and sewer infrastructure considerations such as corrosion.
[8] See Section 7.0 for a description of the PWCS.
[9] Including the Working Draft Permit in Table 6-1 was done for sake of completeness. Inclusion, however, does constitute circular logic. If the AKART study is approved and PSNS&IMF receives mixing zones the final NPDES permit would not include some of the noted permit limits as they would no longer have a reasonable potential to exceed water quality standards.

Table 6-1: Candidate Pollutants of Concern

Reference Permit	Temperature	Aluminum	Copper	Chromium	Iron	Lead	Nickel	Zinc	COD	O&G	PAHs	Phthalates	TSS
MSGP 2000 Sector N Scrap Recycling and Waste Facilities	☐	☒	☒	☐	☒	☒	☐	☒	☒	☐	☐	☐	☒
MSGP 2000 Sector Q Water Transportation	☐	☒	☐	☐	☒	☒	☐	☒	☐	☐	☐	☐	☐
MSGP 2000 Sector R Ship and Boat Building or Repair Yards	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Candidate Pollutant of Concern?	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Yes

The PSNS&IMF NPDES Working Draft Permit also limits arsenic, mercury, oily sheen, total residual chlorine, and turbidity. These are not included in Table 6-1 to keep the size of the table manageable. As already noted the arsenic limit is in question and therefore is not a candidate pollutant of concern. Mercury and total residual chlorine would only be "checked" once eliminating them as a candidate pollutant of concern. Oily sheen is reasonably captured under Oil & Grease and turbidity is reasonably captured under TSS.

The candidate pollutants of concern identified in Table 6-1 were further evaluated as follows:

Temperature: Temperature is limited in the PSNS&IMF Working Draft Permit and Pearl Harbor Naval Shipyard's permit for discharges from the dry docks. The PSNS&IMF Working Draft Permit limit for temperature is based on water quality standards. The Pearl permit limits temperature increase relative to ambient temperature and is a water quality based limit. Temperature is a pollutant of concern for dry dock discharges.

Aluminum: WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington (Ecology 2006b), does not include/address aluminum, and therefore it is not a pollutant of concern. EPA considers aluminum a non-priority pollutant; it does have published water quality criteria but only for freshwater (EPA 2002).

Chromium: The Pearl Harbor Naval Shipyard permit limits the dry dock chromium level to 1.1 mg/l, which is about equal to the WAC 173-201A (Ecology 2006b) marine water quality standard. Chromium is limited in the PSNS&IMF SWDP at a level of 5.0 mg/l. The limit was never exceeded in the period of evaluation, 1998-2007. The vast majority of results are below the detection limit of 0.05 mg/l. The maximum value was 0.68 mg/l. The 1994-1996 PSNS&IMF stormwater monitoring results show a maximum value of 0.2 mg/l. More recent stormwater monitoring shows a maximum value of 0.05 mg/l (J. Brandenberger 2007). Existing information indicates that chromium levels are lower than what would be considered a concern. Chromium is not included in the PSNS&IMF Working Draft Permit. Chromium is not a pollutant of concern.

Copper: Of the candidate pollutants of concern, copper is clearly a pollutant of concern. It is limited by the PSNS&IMF NPDES permit, and as discussed in Section 5.0 that limit is not always met. Copper is also limited in the SWDP. The limit of 5.2 mg/l was exceeded once in the period evaluated (1998 – 2007). Generally, levels are above the 0.05 mg/l reporting limit.

Iron: WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington (Ecology 2006b), does not include/address iron, and therefore it is not a pollutant of concern.

EPA considers iron a non-priority pollutant; it does have published water quality criteria but only for freshwater (EPA 2002).

Lead: Per WAC 173-201A, the marine water quality standards for dissolved lead are: acute 210 µg/l (micrograms per liter) and chronic 8.1 µg/l (Ecology 2006b). In a review of stormwater monitoring data (J. Brandenberger 2007), dissolved lead data reveals a median value of 0.56 µg/l, 75th percentile value of 0.95 µg/l, and a maximum value of 23.4 µg/l. While the maximum value is greater than the chronic water quality standard, all other measures are well below this level. Additionally, ambient monitoring as part of the same referenced effort conducted during and post-storm events did not show exceedances of the criteria. An evaluation of SWDP monitoring data shows that 96 percent of the values are below the 0.05 mg/l reporting limit. The associated SWDP lead limit was never exceeded. Lead is not a pollutant of concern.

Zinc: Per WAC 173-201A, the marine water quality standards for dissolved zinc are: acute 90.0 µg/l and chronic 81.0 µg/l (Ecology 2006b). In a review of the recent stormwater data (J. Brandenberger 2007), dissolved zinc data reveals a median value of 66.65 µg/l, 75th percentile value of 124.50 µg/l and a maximum of 335.00 µg/l. An evaluation of SWDP monitoring data shows that the majority of results exceeded the 0.05 mg/l reporting limit and the 5.0 mg/l SWDP permit limit was exceeded once. These values are in the range where zinc is a pollutant of concern.

Oil & Grease: For the dry dock outfalls, Oil & Grease is monitored weekly and has not been detected. Oil & Grease is not a pollutant of concern for dry dock discharges. There are no current stormwater outfall results for Oil & Grease. Due to the ubiquitous usage of petroleum and lack of current stormwater data, Oil & Grease is a pollutant of concern for non-dry dock areas of PSNS&IMF.

TSS: The stormwater dataset for TSS is limited. The MSGP Sector N benchmark value is 100 mg/l. In a review of the recent stormwater data (J. Branderberger 2007), TSS data reveals a median value of 23 mg/l, 75th percentile value of 35 mg/l and a maximum of 168 µg/l. Overall, these values indicate that TSS is not a pollutant of concern.

Table 6-2 summarizes pollutants of concern.

Table 6-2: Pollutants of Concern

Parameter	Temperature	Aluminum	Copper	Chromium	Iron	Lead	Nickel	Zinc	COD	O&G	PAHs	Phthalates	TSS
Dry Docks	☒	☐	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
Non-Dry Dock Stormwater	☐	☐	☒	☐	☐	☐	☐	☒	☐	☒	☐	☐	☐

6.2 Categorization of Industrial Practices

PSNS&IMF is a large facility, and the type and intensity of industrial activity varies significantly. To efficiently conduct the AKART Study, PSNS&IMF was grouped into industrial practices that were similar in nature and intensity. Physical locations within a group were not necessarily contiguous. Not all areas of PSNS&IMF were included in the grouping. The following criteria determined whether or not to include an industrial practice:

- Is the practice directly associated with vessel work? If not, the practice may not be included in a grouping.
- Certain secondary practices may be included if significant pollution potential exists.
- Is there an actual or potential release of pollutants into surface waters? If no, the practice may not be included in a grouping. For instance, an indoor machine shop is not addressed because all operations and storage takes place indoors.
- Is there potentially differing standards depending on where the practice is located? Specifically, is an operation in a dry dock managed differently than in the shipyard in general? If so, separate groupings result since expectations are different for the two groupings.

There are two main groups. The first being the dry docks and the second being areas outside the dry docks. Table 6-3 describes and further elaborates on the grouping results.

Table 6-3: Industrial Practice Groupings

Industrial Practice	ID	Potential Pollutants
Dry Docks		
Paint Removal	D1	Metals, Organics
Paint Application	D2	Metals, Organics
Stormwater Management	D3	Metals
Groundwater Infiltration (hydrostatic relief)	D4	Metals
Vessel Non-Contact Cooling Water	D5	Metals, Heat
Non-Dry Dock		
Crane and Railroad	SW1	POLs
Metal Recycle	SW2	Metals, POLs, Organics
Metal Components	SW3	Metals
Vehicle and Equipment		
Outdoor Parking and Storage	SW4	POLs
Washing and Cleaning	SW5	POLs, Surfactants
Awaiting Maintenance	SW6	POLs
Outdoor Metal-Work and Cutting	SW7	Metals, Organics
Woodworking	SW8	Organics
Loading and Unloading Operations	SW9	POLs
Trash Containers	SW10	Organics
Storm Sewer and Stormwater Treatment Device Maintenance	SW11	POLs, Metals, Organics
POLs – Petroleum, Oils, and Lubricants		

6.3 AKART Study Focus Areas

Focus areas (correlated industrial practices) are those practices that have the potential to discharge pollutants of concern, copper, zinc, Oil & Grease (for non-dry dock areas) and, temperature (for dry

docks). Table 6-3 categorized PSNS&IMF industrial practices. Table 6-4 was developed by looking at potential pollutants for each practice with the pollutant of concern. If there was a reasonable match then the industrial practice is considered an AKART Study focus area. An AKART analysis will be conducted for the focus areas.

Table 6-4: Focus Areas

Focus Areas	Potential Pollutants	Associated Facilities (see Figure 1)
Dry Docks		
Paint Removal (D1)	Metals and Organics	These operations take place in all six dry docks. Stormwater management includes the PWCS.
Paint Application (D2)	Metals and Organics	
Stormwater Management (D3)	Metals	
Hydrostatic Relief Groundwater (D4)	Metals	All dry docks incorporate, by design, hydrostatic relief with the exception of Dry Dock 2.
Vessel Non-Contact Cooling Water (D5)	Metals, and Heat	Most vessels in dry dock require non-contact cooling water. Sinclair Inlet is the source of the cooling water.
Non-dry dock		
Crane and Railroad (SW1)	POLs	Primarily on the east side of building 450 (north of Dry Dock 6).
Metal Cutting/Recycle (SW2)	Metals, POLs, Organics	(1) Northeast of Dry Dock 3. (2) Building 368 Northeast of Dry Dock 6. (2) RMTS (Northeast of Dry Dock 6).
Metal Components (SW3)	Metals	Steelyard (eastern end of PSNS&IMF).
Vehicle and Equipment		
Outdoor Parking and Storage (SW4)	POLs	Multiple locations.
Washing and Cleaning (SW5)	POLs, Surfactants	W. side of building 455 (north of Dry Dock 6).
Awaiting Maintenance (SW6)	POLs	South of Building 455.
Outdoor Metal-Work and Cutting (SW7)	Metals and Organics	Various non-fixed locations.
Loading and Unloading Operations (SW9)	POLs	Many locations.
Storm Sewer and Stormwater Treatment Device Maintenance (SW11)	POLs, Metals, Organics	NA. Treatment devices are shown on Figure 1.

POLs – Petroleum, Oils, and Lubricants

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7 Overview of Current PSNS&IMF Pollution Prevention Practices

This section outlines current pollution prevention practices in use at PSNS&IMF. Other sections of the Study provide additional details and analysis of these practices. Pollution prevention practices take many forms including traditional structural and non-structural stormwater Best Management Practices (BMPs), capital improvement projects, work practices, and treatment facilities. Per WAC 173-201A, the concept of AKART applies to both point and nonpoint sources of pollution. The term "best management practices, typically applies to nonpoint source pollution controls and is considered a subset of the AKART." (Ecology 2006a)

7.1 Conventional Best Management Practices

The current PSNS&IMF NPDES Permit requires the permittee to develop and implement a BMP Plan. The BMP Plan goal is to "operate the facility in accordance with BMPs which prevents or minimizes the generation of pollutants, their release, and potential release." Historically the BMP Plan applied mainly to dry dock activities. Separately in the NPDES permit, PSNS&IMF is required to develop a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP "shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with industrial activity from the facility." PSNS&IMF has implemented both these requirements. The BMP Plan provides an overall framework for water pollution prevention and includes overarching conventional BMPs.

The BMP Plan, which incorporates the SWPPP, is institutionally implemented through PSNS&IMF instruction 5090.30A. The instruction assigns responsibilities to various organizational components of PSNS&IMF as related to water pollution prevention. Some specific implementation measures are an annual stormwater Comprehensive Site Compliance Evaluation, dry dock pre-flood cleanliness inspections, control of shipboard discharges (including sewage, bilge water, and ballast water), and sampling and analysis.

Conventional BMPs currently in place at PSNS&IMF are included in Attachment 3.

7.2 Process Water Collection Systems (PWCS)

The name is somewhat of a misnomer. While the PWCS can be used to collect process waters such as hydroblast water, the day-to-day function is collecting and appropriately routing dry dock stormwater. The PWCS can route collected stormwater to the sanitary sewer, a service gallery connection (portable tanks or barge), or Sinclair Inlet. Typically, the PWCS discharges "contaminated" stormwater into the sanitary sewer. The level of "contamination" is determined by in-line turbidity probes. When a defined turbidity level is reached, the controller routes stormwater into the sanitary sewer. Non-"contaminated" stormwater is discharged into Sinclair Inlet via the dry dock drainage systems. The daily volume limit for all dry dock discharges into the sanitary sewer is 400,000 gallon as imposed by SWDP ST-7374. The PWCS provides fairly direct feedback on operations in the dry docks with the measurement of real-time flow rate and turbidity. For example, if a new BMP is instituted and lower storm event turbidity levels are shown, the BMP would be considered successful. If higher flow rates are observed in a dry dock when it is not raining, it could be due to a leaking hose, which would be corrected.

7.3 Dry Dock Settling Basins

The dry docks are equipped with settling basins and troughs for removing heavier particulates entrained in stormwater. Settling capability varies by dry dock since each is configured differently. The basins and troughs are cleaned prior to dry dock "flooding."

7.4 Stormwater Treatment Devices

There are a number of oil/water separators connected to the storm sewer for minimizing release of non-point source petroleum and pollutants. Most of the separators are of standard design. There are two locations that incorporate advanced stormwater treatment units. The Recycle Material Transfer Site (RMTS) incorporates a Continuous Deflective Separation (CDS™) pretreatment device and follow-on media filtration with a Stormwater Management Incorporated's[10] Stormfilter™. The main component of the Stormfilter™ is cartridge media filters that are placed in a below-grade vault downstream of the CDS™ unit. The CDS™ unit removes solids from stormwater by inducing a swirling action. A Vortechs™ stormwater treatment device is located in the steelyard at the eastern boundary of PSNS&IMF. The unit is designed to remove sediment and oil from stormwater by promoting a swirling motion, which concentrates and entrains pollutants. Figure 1 shows the location of existing stormwater treatment devices.

Most storm sewer catch basins have sumps for retaining heavier materials that are entrained in stormwater.

PSNS&IMF uses non-woven fabric catch basin inserts at strategically located catch basins to help minimize pollutants. Foss and StreamGuard™ makes inserts typical of those used by PSNS&IMF.

7.5 Vessel Paint Removal, Containments, and Enclosures

Containments refer to constructed areas with a high level of environmental control typically associated with paint removal. The control may be negative pressure ventilation, humidity control, and air filtration. Enclosures, on the other hand, refer to a structure that affords a degree of weather protection, which could be a simple covering to keep the rain out to a temporary building. Enclosures do not provide dry blast containment capability. Exterior vessel paint is removed using a number of methods and different types of containments.

For smaller areas, a glove bag or a portable containment system may be used. The portable containment system uses sheeting held in place with extendable poles developed for this application. PSNS&IMF is working with industry to develop a laser coating removal system for small areas. The project is still in the early stages and viability will not be known for some time.

Larger paint removal operations are typically conducted in containments with negative pressure ventilation, air filtration, and humidity control. Containments are designed for a specific application/location and may be supported by staging, plywood/wood, or attached to existing components such as keel blocks. The containment walls are typically constructed of a heavy industrial grade fabric or shrink wrap. Typically, in this method scaffolding is erected around the work area. Shrink wrap is installed on the outside of the scaffolding to form an enclosed work area. The "floor" may be the existing concrete dry dock floor, industrial fabric, or a plywood floor. The roof can be constructed of shrink wrap, industrial fabric, or a pre-manufactured roof placed atop the scaffolding. The roof structure can be placed atop the scaffolding with or without the shrink wrap depending on the degree of weather protection/environmental control desired.

For larger containments an entry/exit vestibule is constructed. Fabric doors with Velcro® closures are on either end of the vestibule to maintain climate conditions and to prevent release of dust/debris from the containment. Containments are inspected by PSNS&IMF prior to allowing work inside.

[10] Stormwater Management Inc., is now part of CONTECH Stormwater Solutions Inc., www.contech-cpi.com

Within containments, paint is removed using a number of methods. Steel grit blasting is commonly used for large areas. The steel grit is collected and reused, which significantly reduces overall waste generation, particularly when compared to single use blasting materials such as slag; this process is still commonly used at many shipyards. PSNS&IMF also uses sponge blasting for paint removal and preparing the surface for new paint. In this method abrasive impregnated sponges are blasted against the subject surface removing the paint. Per Norton Sandblasting, a supplier of sponge blast equipment, "The pliant nature of Sponge Media allows its particles to flatten on impact exposing the abrasive. After leaving the surface, the media constricts, pulling and encapsulating what would normally have become airborne contaminants." The environmental benefits of sponge blasting are a significant reduction of dust generation and that sponge media can be cleaned and reused.

For larger, uninterrupted surfaces, PSNS&IMF uses a remotely operated hull crawler. The crawler uses ultra-high pressure water (40-50,000 psi) to remove paint. The wastewater is integrally removed via vacuum, treated, and either recycled back to the blast head or captured for follow-on treatment. Crawlers hold themselves to the hull with magnets or by using the vacuum system that removes wastewater. Traditional containment system is unnecessary when using a hull crawler. Environmental benefits are no potential of fugitive emissions and little waste. PSNS&IMF only infrequently uses open-lance high pressure water blasting; when used, watertight catchments are placed/constructed below the open-lance blasting for capturing the wastewater. A disadvantage of high pressure (either open-lance or hull crawler) blasting is that a high level of wastewater treatment is required, particularly when recycling the water back to the blast head, and this method does not produce a profile on the hull surface. Primary concerns when treating and recycling the water are salt buildup, associated surface corrosion, and inadequate paint adhesion. PSNS&IMF is currently working with industry partners to design more efficient treatment technologies. Due to the surface corrosion issue, the trend is toward single-pass treatment followed by disposal rather than recycling. PSNS&IMF is also working with academia and industry in developing a water blast system that injects garnet grit into the high pressure water stream. If successful, the system will produce a profile and significantly increase productivity. The productivity increase results in decreased wastewater volume. Integral to the blasting process the garnet is cleaned and recycled back to the blast head.

PSNS&IMF uses enclosures as standard practice on vessel recycling projects in dry dock. The enclosures afford greater worker safety and comfort, a higher degree of process control, and increased environmental protection. Enclosures are typically Tensioned Fabric Structures which are manufactured structures consisting of arched steel or aluminum frames spaced as regular intervals and covered with a tensioned fabric, typically reinforced PVC. The structures are shipped flat and erected on site. For surface vessels undergoing recycle, PSNS&IMF uses tensioned fabric structures on rails that can be moved and nested to allow crane access, see Figure 8. The environmental benefit of enclosures is to keep stormwater from contacting industrial processes and thus avoiding contamination of water and more effective clean-up of debris since it does not get wet.

7.6 Paint Application

Airless spray painting and manual methods (roller) are the main paint application method used by PSNS&IMF, with epoxy being the primary paint type in use and anti-fouling coatings being secondary. The transfer efficiency of this painting method is in the 40 to 60 percent range (Tricou, 2005). PSNS&IMF, as a pollution prevention measure when using two-part epoxy paint, uses equipment that mixes the epoxy components at the paint head rather then premixing them. With premixing, any excess epoxy becomes waste. With mixing at the paint head, excess is saved and used another time. Additionally,

less solvent is needed to clean the mix-in-head equipment than the premix method. PSNS&IMF is currently working with academia on developing a new type of effervescent paint system, which could result in transfer efficiencies in the 90 percent range. If this system proves viable and put into use, it would decrease emissions.

7.7 Metal Cutting Associated with Vessel Recycling

Metal components and hull sections removed from vessels undergoing recycling are either placed on a barge or in a rail car for delivery to the scrap metal merchant. For barge delivery, the process is straightforward; the metal is removed from the vessel, placed on the barge, and then taken directly to the vendor. For rail car delivery, the metal usually requires cutting into smaller pieces. The cutting is done at two facilities, one adjacent to Dry Dock 3 and one in Building 368, the main cutting facility. When cutting is underway in Building 368, the air is processed through four 50,000 cubic feet per minute (cfm) cartridge filter systems for a total of 200,000 cfm capacity. The Dry Dock 3 facility is similar but smaller (60,000 cfm) and has an adjacent outdoor cutting pad. The outdoor pad is used to cut extra-large components. Stormwater that collects on the pad is removed and sent to treatment. Slag from cutting operations is collected; when a sufficient quantity accumulates, it is also recycled as it is a smeltable material.

7.8 Dry Dock Sources Control and Cleaning

PSNS&IMF use a variety of source control and cleaning methods. Listed below are some of the more common.

Dry docks are cleaned on a daily basis using primarily manual methods such as sweeping. PSNS&IMF recently purchased a trailer mounted vactor (vacuum) unit with pressure washer to help clean prior to dry dock "flooding". In addition, PSNS&IMF has seven sweeper cleaning machines, five walk-behind types, and two riding units. These may be used in the dry dock or other indoor or outdoor areas. The downside of sweeper machines is that they can break-up debris, making clean-up more difficult; they do not work well on wet materials/surfaces; and their size limits accessibility. For recycle projects, PSNS&IMF is now evaluating using small vacuums on/in the vessel, removing the debris before it can reach the dry dock floor. In this manner, the debris may be drier (since enclosures are used) and therefore easier to remove. It may also be in larger pieces, again making it easier to remove.

Vacuum shrouded tools are becoming more commonly used at PSNS&IMF. Sanders are primarily used but also descalers, grinders, and needle guns. Using in-house resources PSNS&IMF developed a vacuum shroud for needle guns, they may license it. For sanding and grinding, a key component of pollution minimization is not only the vacuum aspect but careful selection of the abrasive type and grit. PSNS&IMF regularly evaluates new types of abrasives such as plastic with embedded abrasive.

When a vessel is in dry dock, non-contact cooling water is temporarily piped to the dry dock drainage system to prevent contact with debris that may be on the dry dock floor.

It should be noted that the PWCS plays a role in the overall management of material that may reside on the dry dock floor.

7.9 Bilge Water

Vessel bilge water is treated in one of three treatment plants known as oily wastewater treatment systems (OWTS). Each has a treatment capacity of 50 gpm. Effluent from the OWTS units is discharged into the

sanitary sewer per the PSNS&IMF SWDP. A project is currently underway to replace the existing OWTSs with new units, each with a treatment capacity of 200 gpm. The new units will have a polishing filtration step to provide higher quality effluent than the current units.

8 Dry Dock and Stormwater Effluent Characterization

Both general yard stormwater and dry dock effluents are characterized to provide an understanding of (1) effluent levels from PSNS&IMF and (2) how effluent levels have changed over time. The effluent characterization focuses on copper and zinc as the pollutants of concern (see Section 6.0). Estimating how effluent levels have changed over time will provide an understanding of how management practices have performed.

8.1 Non-Dry Dock Stormwater

8.1.1 Stormwater Monitoring Data Sources

Two sets of stormwater monitoring data were evaluated. The first was collected between 1994 and 1996 as required in the PSNS&IMF NPDES Permit. PSNS&IMF collected samples from 13 outfalls (see Table 5-2). Analytical parameters varied by outfall but generally included copper and zinc. The dataset includes total recoverable metals.

The second dataset was developed by the Pacific Northwest National Laboratory operated by Battelle Memorial Institute (Battelle) as part of the Surface and Stormwater Quality Assessment for Sinclair and Dyes Inlet, Washington, currently in draft form (J. Brandenberger 2007). The data covered the years 2002 to 2005 and was developed to gain an understanding of the quality of water discharges into Sinclair and Dyes Inlet. The dataset includes results from a number of surface water and non-PSNS&IMF stormwater outfalls. For the purposes of this report only stormwater monitoring results from PSNS&IMF stormwater outfalls were evaluated. The dataset includes total and dissolved metals.

The datasets differ is some regards:

- The PSNS&IMF samples were analyzed using the total recoverable digestion method, and the Battelle data was analyzed using the total digestion method. Since the "total" method is a more aggressive digestion method than the "total recoverable" method, the Battelle results are likely to be higher, assuming all else is equal. The impacts of a more aggressive digestion method would be greater depending on the level of particulate in the sample. Overall, considering the significant variability of stormwater, this difference is not deemed significant in the context of this evaluation.
- The PSNS&IMF samples were grab samples taken, as much as possible, during the beginning of the storm event. A single grab sample was collected per storm event. Battelle collected intra-storm event grab samples to better characterize and therefore model pollutant levels for the whole of the storm event. Typically, three grab samples were collected per storm event.
- The stormwater outfall sample locations in the two sampling periods did not fully correspond. Thirteen outfalls were sampled in both sampling periods, but only 5 of the 13 outfalls sampled in the second period were the same location as those sampled in the first sampling period.
- The evaluation was based on stormwater metal concentration values. NAVFAC Northwest did not evaluate potential changes associated with pollutant loadings (mass of pollutant discharged per unit time). While some correlation between concentration and loading is expected, the higher-flow outfalls would tend to dominate the resultant loadings. Using only concentration values places equal weight on each of the outfalls regardless of the area it serves.

8.1.2 Data Evaluation

Table 8-1 provides basic information regarding the two stormwater outfall datasets.

Table 8-1: Basic Dataset Information – Stormwater

Conducted by:	PSNS&IMF	Battelle
Sample Collection Timeframe	29 Apr 94 to 28 Oct 96	16 Sept. 02 to 20 Mar 05
Purpose	Compliance with NPDES permit WA-000206-2	Component of the Environmental Investment (ENVVEST) project is to conduct a surface and stormwater quality assessment of Sinclair and Dyes Inlet
Scope of Monitoring Effort	Monitoring limited to stormwater outfalls as specified in the NPDES permit.	Extensive effort including monitoring of surface waters, effluents, and many stormwater types.
Related applicable data	None.	The dataset includes dissolved metals. This is valuable to evaluate relative to water quality standards. Since this was/will be done in the Battelle Study, it was not completed as part of this report.
Number of Non-Detect Values	Copper = 0 Zinc = 0	Copper = 0 Zinc = 0

As noted in Section 6.0, the two parameters of interest are copper and zinc. Total metals (either total or total recoverable) was in both datasets and therefore selected for comparative purposes. The datasets were grouped in two ways: 1) evaluation of overall changes in stormwater quality from PSNS&IMF and 2) evaluation of changes from specific outfalls.

8.1.3 Overall Stormwater Quality

Summaries of stormwater quality are provided below. There are two outfall naming conventions in use at PSNS&IMF. The PSNS&IMF NPDES permit names the 13 outfalls with traditional NPDES naming conventions such as 003 and 006. However, PSNS&IMF uses a numeric naming convention for all outfalls such as 124 and 115.1. The 13 NPDES named outfalls correspond with the PSNS&IMF designation as shown in Table 8-2. In this Study stormwater outfalls will be identified by the NPDES permit naming convention with the PSNS&IMF naming convention in parenthesis, such as 003(124).

Table 8-2: Outfall Naming Convention Cross-Reference

NPDES Permit Designation	PSNS&IMF Designation
002	126.1
003	124
006	115.1
010	081.1
012	053
013	020.1
014	015

Table 8-2: Outfall Naming Convention Cross-Reference

NPDES Permit Designation	PSNS&IMF Designation
022	008
025	124.1
028	107
030	082.5
040	014
052	101

Table 8-3 provides a statistical summary of the two datasets.

Table 8-3: Summary of Both Datasets

Parameter	Median			Mean (L-N)			75th Percentile		
	PSNS n=50	Battelle n=50	Reduction	PSNS n=50	Battelle n=50	Reduction	PSNS n=50	Battelle n=50	Reduction
Copper (µg/l)	93	36	61%	172	63	64%	208	75	64%
Zinc (µg/l)	290	97	66%	447	149	67%	538	160	70%
L-N: Log-normal distribution. Values calculated using the log-normal distribution.									

Percent reduction was calculated as follows: [(PSNS&IMF – Battelle)/ PSNS&IMF] x 100. Table 8-3 indicates, independent of the variable evaluated, that there was a 60 percent reduction in copper and zinc concentrations over the approximately six years. One concern in the comparison is that the Battelle data would tend to be lower due the averaging effect of intra-storm sampling. This however does not seem to be significant. In addition, the difference in digestion method between the two data sets would tend to produce higher values for the Battelle data. A comparison of maximum values (not shown) reveals the same approximate 60% reduction for zinc. For copper the maximum value reduction was 30%. Overall, considering the other statistical measures and the high variability of a single point value (maximum), it is reasonable to conclude that the averaging effect of intra-storm sampling is not significant and a 60% reduction has occurred.

8.1.4 Outfall Specific Stormwater Quality

Table 8-4 compares results for those outfalls that were monitored in both events. A definitive trend of how pollutant levels have changed over time, by outfall, can not be determined due to the limited number of samples. The data, however, are useful in providing an indication of pollutant changes over time. Table 8-4 provides this indication. Again, due to the limited amount of data, results in terms of parameter changes over time are qualitative and are expressed as "increase," "decrease," or "no change."

Table 8-4: Stormwater Outfall Summary

Outfall/Parameter	Parameter Change Over Time			Note
	Decrease	Increase	No Change	
Outfall 003(124)				
Copper	☐	☒	☐	The area contributing to Outfall 003(124) is located between dry docks 3 and 1. Copper levels at this location may be associated with particular projects in the adjacent dry docks during the time of monitoring rather than an indication of how copper levels may have changed over time.
Zinc	☐	☐	☒	
Outfall 006(115.1)				
Copper	☒	☐	☐	Copper and zinc levels from outfall 006(115.1) decreased over the six year period.
Zinc	☒	☐	☐	
Outfall 010(081.1)				
Copper	☒	☐	☐	Copper levels from outfall 010(081.1) decreased over time. There was no apparent change in zinc levels.
Zinc	☐	☐	☒	
Outfall 014(015)				
Copper	☒	☐	☐	Copper and zinc levels from outfall 014 (015) decreased.
Zinc	☒	☐	☐	
Outfall 022(008)				
Copper	☒	☐	☐	Copper and zinc levels form outfall 022(008) decreased.
Zinc	☒	☐	☐	

8.1.5 Stormwater Effluent Characterization Summary

- Stormwater concentrations of copper and zinc discharging from PSNS&IMF have decreased roughly 60% over the six year period from 1996 to 2002 (see Table 8-3).
- Stormwater mean concentrations, for the sake of evaluating AKART technologies, are:
  - Total Copper: 63 µg/l
  - Total Zinc: 149 µg/l

8.2 Dry Dock

The primary pollutant of concern for the dry dock discharge is copper. Currently, copper is the only toxic pollutant regularly monitored. Oil & Grease has to this point not been detected in the effluent. Similar to how stormwater was evaluated; a dividing line was established for evaluating changes in pollutant levels over time. The dividing line was established as of May 2000 when PSNS&IMF began effective operation

of the PWCS. See Section 7.0 for a description of the PWCS. While the PWCS began effective operation in May 2000, PSNS&IMF has continually improved the PWCS including software reprogramming, hardware changes, infrastructure upgrades, and sensor upgrades. Due to this continual improvement process, the May 2000 dividing line diminishes recent process improvements. Additionally, and very importantly, the PWCS is not the only means used for minimizing pollutant discharges into Sinclair Inlet. PSNS&IMF has a continual process improvement model for all production practices, many of which minimize pollutant discharges. Other factors that impact the discharge are the type and intensity of work being conducted and weather patterns. Table 8-5 contains basic information about the dataset used for evaluating changes in dry dock copper levels over time.

Table 8-5: Basic Dataset Information – Dry Docks

Conducted by:	PSNS&IMF
Sample Collection Timeframe	4 January 1995 to 11 September 2007
Pre-PWCS Timeframe	4 January 1995 to 30 May 2000
Post-PWCS Timeframe	6 June 2000 to 11 September 2007
Purpose	Compliance with NPDES permit WA-000206-2
Related applicable data	None.
Total dataset count (n)	n=1389
Number of Non-Detect Values	965 [Detection limit is 10 µg/l]
Apparent Data Distribution	Delta-lognormal[11]

The first observation about the entire dataset is the high percentage of non-detect values. Sixty nine (69) percent of all values are non-detect; in other words, 69% of the weekly copper samples are less then 10 µg/l which is the detection limit. Table 8-6 breaks this down by outfall.

Table 8-6: Copper Non-Detect Percentage by Dry Dock Outfall

Outfall	Percent Non-Detect for Copper
018A	64%
018B	54%
096	49%
019	82%

Looking at the percentage of non-detect results by outfall reveals that Outfall 019 (Dry Dock 6) has the highest non-detect percentage, most likely due to the relatively higher groundwater contribution. Dry docks 1 through 5 (outfalls 018A/B and 096) also have high non-detect percentages (≥50%). Due to the high percentage of non-detect values, conducting standard descriptive statistical analysis (i.e., calculating the mean and standard deviation) would provide misleading results and was therefore not conducted (Helsel 1990). While NAVFAC Northwest did not conduct descriptive statistical analyses, the data was evaluated by looking at simple trends in the percentage of non-detect values over time and the percentage

[11] A non-rigorous review of the full dataset indicated a delta-lognormal distribution, which is typical of datasets with a significant proportion of results below the analytical detection limit.

below the 19 µg/l monthly average permit limit. The data was evaluated by selecting a copper concentration cutoff and determining the percentage of results below that cutoff pre- and post-PWCS. The two cutoffs selected were the detection limit of 10 µg/l and the copper monthly average NPDES permit limit of 19 µg/l. Table 8-7 is the outcome of this evaluation.

Table 8-7: Non-Detect Percentage by Outfall Pre- and Post-PWCS

Dry Dock Outfall	Percent of Copper Results Below the Detection Limit	Percent of Copper Results Below 19 µg/l (monthly average permit limit)
018A		
Pre-PWCS	57%	80%
Post-PWCS	68%	90%
018B		
Pre-PWCS	45%	72%
Post-PWCS	67%	94%
096		
Pre-PWCS	52%	89%
Post-PWCS	45%	93%
018A, 018B, and 096		
Pre-PWCS	50%	76%
Post-PWCS	66%	92%
019		
Pre-PWCS	80%	88%
Post-PWCS	84%	95%
All Dry Dock Outfalls		
Pre-PWCS	59%	80%
Post-PWCS	71%	93%

Table 8-7 helps answer the question: Is the PWCS effective in reducing pollutant loadings into Sinclair Inlet? More specifically, due to the limits and type of data, does the PWCS help decrease effluent copper levels[12]? Overall, the answer is clearly yes. Prior to the PWCS operation 59% of effluent sample results were below 10 µg/l. After PWCS operation, that value increased to 71%. For Outfall 019 (Dry Dock 6) the increase is not as stark but is still indicated. Overall for Outfalls 018A, 018B, and 096 (dry docks 1 through 5) the increase is significant, changing from 50% to 66%. Outfalls 018A and 018B demonstrate similar increases. Outfall 096 shows a small decrease (i.e., more results were above the detection limit post-PWCS). This is most likely due to the small dataset for Outfall 096.

[12] While the focus of this section is on the PWCS, PSNS&IMF has instituted a number of other pollution prevention practices (including source control) prior to and in conjunction with the PWCS. There is no way to parse out the sole contribution of the PWCS from other pollution prevention measures.

An evaluation using the 19 µg/l cutoff was similar to the 10 µg/l cutoff evaluation. The percentage of values less than the 19 µg/l cutoff increased after operation of the PWCS. Outfall 096 was roughly equivalent pre- and post-PWCS, as was the case with the 10 µg/l cutoff.

Changes in copper loadings (mass of copper discharged per unit time) were not evaluated due the detection limit issue discussed. It stands to reason, however, that if effluent concentrations have decreased (as they have) the loadings would correspondingly decrease. A related concern would be if flows increased over time then loadings could correspondingly increase even if concentrations decreased. An evaluation of annual average dry dock flow from 1995 to 2007 indicates high variability and a possible increase in average flow. The maximum flow rates have increased due to the number and type of projects, however future flows will depend on the future workload

Theoretically, the PWCS will reduce maximum concentrations of pollutants and result in overall lower peak concentrations. This was evaluated by averaging the highest 10% of outfall copper concentration values both pre- and post-PWCS and comparing them. Outfall 096 was excluded since the highest 10% of the copper values included significant non-detect values. The reduction in maximum value, due at least partially to the PWCS, is significant. The reduction was about 70%. For Outfall 019, for example, the pre-PWCS copper value was 99 µg/l; post-PWCS was 27 µg/l. The resulting concentration reduction was 73%.

8.2.1 Dry Dock Effluent Characterization Summary

- Concentrations of copper and zinc, from the 5 compared outfalls, generally indicate decreases over the same period. For some outfalls, however, there is no apparent change and for one outfall, copper levels increased (see Table 8-4). The data however, is very limited making any conclusions provisional.
- The dry dock PWCS along with other process changes/improvements has resulted in significant decreases in effluent copper concentrations. The fraction of results below the 19 µg/l NPDES Permit limit increased from 53% to 61%.
- The dry dock PWCS has significantly reduced effluent variability as observed by a decrease in maximum effluent copper concentrations by approximately 70%.

9 Similar Facility Evaluation

Per Ecology guidelines (Ecology 2006a), one method of defining AKART for a specific facility is consideration of the treatment performance of a similar facility or group of similar facilities. This section identifies and elaborates on facilities similar to PSNS&IMF and presents information that may be used to help define AKART for PSNS&IMF.

Seven facilities were selected for evaluation. Table 9-1 summarizes basic information for each facility.

The facilities were selected based on a number of factors as follows:

- Facility Size: Since PSNS&IMF is a large facility, similar large facilities were also selected as much as possible. Facility size was mainly based on the number of dry docks. A facility with:
    - Zero to two dry docks is considered a small facility.
    - Three to four dry docks is considered a medium facility.
    - More than four dry docks is considered a large facility.

Unfortunately, no ideal method exists to categorize shipyards. The number of dry docks for instance does not capture differences in terms of size and complexity of the industrial operations. For example, Todd Shipyard qualifies as a "medium" sized shipyard using the number of dry docks as a measure, but their industrial area covers 10 acres with 4 stormwater outfalls vs. the BNC's 200-plus acres of industrial area, (Dry Dock 6 alone, covers over 5 acres), containing 156 stormwater outfalls. However, using a linear scale based on acreage has issues of its own, not the least of which is that the majority of other shipyards would rate as small or very small by comparison. Another important difference between these shipyards is the type of vessels being serviced. Shipyards that service nuclear powered vessels, (PSNS&IMF, Norfolk, Portsmouth, and Pearl Harbor Naval Shipyards, and Electric Boat), must manage significantly higher volumes of cooling water than those shipyard that do not service nuclear vessels.

Information gleaned from small and medium facilities are useful since:

- There are not many large shipyards, particularly in Washington. The overall usefulness of the evaluation would be limited if it only focused on large facilities. Including small and medium facilities provides a greater depth of information.
- Implementation of stormwater pollution controls at small and medium facilities may act as a bellwether for what is to come for larger facilities. Identification of AKART for small and medium facilities may relate to what AKART is or will be for larger facilities.

- Location: For comparative purposes (and therefore inclusion in Table 9-1) facilities in Washington State were given greater priority than those out-of-state. AKART is an Ecology defined and implemented principal. The details of how AKART was implemented at other in-state facilities directly relates to how it might be implemented at PSNS&IMF. Since nationwide there are not many facilities the size of PSNS&IMF, a number of out-of-state facilities were included in Table 9-1.

While both Norfolk Naval Shipyard and Newport News Shipyard were originally considered, only Norfolk is included. This is because Virginia strives to maintain a level of equality in permits issued to similar types of industrial facilities, so both the Norfolk Shipyard and Newport News permits are substantially similar.

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Table 9-1: Basic Facility and NPDES Permit Information

Facility	PSNS&IMF	Cascade General Portland Shipyard	Electric Boat Shipyard	NASSCO – General Dynamics	Norfolk Naval Shipyard	Portsmouth Naval Shipyard	Pearl Harbor Naval Shipyard	Todd Shipyard
City	Bremerton	Portland	Groton	San Diego	Norfolk	Portsmouth	Pearl Harbor	Seattle
State	WA	OR	CT	CA	VA	ME	HI	WA
Permit #	WA-000206-2	101393	CT0003824	CA0109134	VA0005215	ME0000868	HI 0110230	WA-000261-5
Effective Date	1 April 1994	31 Mar 2004	4 July 2006	5 February 2003	25 April 2005	5 May 2006	24 April 2008	1 October 2002
Permit Authority	EPA Region X	ORDEQ	CTDEP	CRWQCB	VADEQ	MEDEP	HDOH	WDOE
Receiving Water	Sinclair Inlet (MW)	Willamette River (FW)	Thames River (FW)	San Diego Bay (MW)	Elizabeth River (FW) Paradise Creek (FW)	Piscataqua River (MW)	Pearl Harbor (MW)	Elliot Bay (MW) Duwamish West Waterway
Number of Dry Docks	6	2	3	2 (and two shipways)	8 (with 5 in-use)	3	4	3
Facility Size	Large	Small	Medium	Medium (due to the shipbuilding ways)	Large	Medium	Medium	Medium

CRWQCB ..... California Regional Water Quality Control Board
CTDEP ..... Connecticut Department of Environmental Protection
FW ..... Fresh Water
HDOH ..... Hawaii Department of Health
MEDEP ..... Maine Department of Environmental Protection
MW ..... Marine Water
ORDEQ ..... Oregon Department of Environmental Quality
VADEQ ..... Virginia Department of Environmental Quality
WDOE ..... Washington Department of Ecology

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Table 9-2 outlines stormwater and dry dock monitoring for the facilities addressed in this section. Monitoring of dry dock effluent is included if it was associated with stormwater discharges from a dry dock. Table 9-2 does not comprehensively include all required monitoring as may be specified in NPDES permit(s). Only parameters commonly associated with shipyards were included.

Information regarding each facility is provided below.

9.1 Puget Sound Naval Shipyard and Intermediate Maintenance Facility

PSNS&IMF is located in Bremerton Washington and holds NPDES permit WA-000206-2 issued by the EPA. The dry dock discharge is composed mainly of hydrostatic relief groundwater, cooling water, potable water, and dry dock floor stormwater runoff. The dry docks are equipped for discharging stormwater into the sanitary sewer, which helps ensure copper permit limits are achieved. The permit required monitoring the dry dock discharges for lead, mercury, zinc, and toxicity during the first year after issuance. This requirement was met and the monitoring is now discontinued (see Table 5-2).The permit does not impose limits on general yard stormwater discharges. Stormwater sampling was required in the first two years of the currently effective permit. The parameters varied by outfall and included metals but not toxicity (see Table 5-2).

The permit requires development of a BMP plan, directed primarily at the dry docks, and a SWPPP for other industrial (but non-dry dock) areas of the shipyard. The permit imposes standard requirements for the BMP Plan and SWPPP. Standard requirements refer to BMPs such as good housekeeping, spill prevention and response, preventive maintenance, and employee training. Some permits include facility-specific and/or industry specific BMPs. BMPs currently in-use at PSNS&IMF are listed in Attachment 3.

9.2 Cascade General Portland Shipyard

The Cascade General Portland Shipyard (Cascade) is located in Portland, Oregon on a 60-acre site adjacent to the Willamette River. Cascade holds an NPDES permit associated with discharge from the dry docks. The permit restricts discharge of dry dock stormwater to surface water "until such time as the permittee demonstrates that the discharge from outfall 002 does not exhibit toxicity." Due to this condition Cascade collects all dry dock stormwater and process water in a 1 million gallon tank. After treatment Cascade discharges the effluent into the sanitary sewer. General yard stormwater discharges at the facility are covered by the Oregon Industrial Stormwater General Permit (1200-Z), a separate NPDES permit (Oregon 2007). The Oregon Industrial Stormwater General Permit does not contain stormwater limits but does have benchmarks. If benchmark values are exceeded over time, "the department will revoke the permit registrant's coverage under this permit and will require the permit registrant to apply for an individual permit." Cascade did not anticipate consistently achieving benchmark values and therefore voluntarily opted into Oregon's superfund clean-up program for stormwater, which includes upland stormwater and near-shore sediment concerns. Cascade, per this risk based program, is currently conducting pilot tests using infiltration, permeable asphalt, engineering controls, and treatment. Cascade did have a Stormwater Management Inc. StormFilter™ treatment unit installed for treating stormwater from a 5 acre area. While the unit reduced metals by about 20 percent, it did not decrease effluent toxicity. The most likely long term stormwater management solution will be infiltration, although this decision is not yet final (Source: personnel communication with T. Alan Sprott, Cascade General, 5/10/07). Even though Cascade does not discharge dry dock stormwater, they are authorized a mixing zone per their NPDES permit.

9.3 Electric Boat Shipyard

The Electric Boat Shipyard is a General Dynamics business. Electric Boat provides design, construction, and support of submarines for the U.S. Navy. Electric Boat holds NPDES permit # CT0003824, primarily for discharges from their dry docks. Monitoring of dry dock discharges is extensive and includes whole effluent toxicity, metals, convention pollutants, and some organics.

NPDES coverage for general yard stormwater is via the Connecticut Department of Environmental Protection's (CTDEP) General Permit for the Discharge of Stormwater Associated with Industrial Activity. Under this permit, monitoring is required for 10 parameters including toxicity. The associated value for each parameter was statistically derived by CTDEP based on previously submitted stormwater results. It is not specifically a benchmark, but rather a cutoff value to determine future monitoring frequency.

9.4 National Steel and Shipbuilding Company

National Steel and Shipbuilding Company (NASSCO), a General Dynamics company, holds NPDES permit CA0109134 issued by the California Regional Water Quality Control Board. The permit prohibits the discharge of the first flush of stormwater runoff directly into San Diego Bay from high risk areas unless toxicity standards are achieved. This permit defines first flush as the first one-inch of rainfall during the storm event. This effectively requires NASSCO to collect all stormwater. The probability of exceeding the first flush volume criteria is low. From April through November the total average monthly precipitation is less than one inch. San Diego's annual average total precipitation is 9.97 inches (source: http://cdo.ncdc.noaa.gov/climatenormals/clim84/CA/CA893112.txt). The probability of the mean number of days that precipitation will exceed one inch is two days in a year (source: http://cdo.ncdc.noaa.gov/climatenormals/clim20/ca/047740.pdf).

Dry dock groundwater infiltration and vessel non-contact cooling is discharged to San Diego Bay without treatment.

All dry dock stormwater is collected. NASSCO currently diverts both dry dock and yard stormwater to the sanitary sewer (San Diego Metropolitan Sanitary Sewer System). Although NASSCO discharges stormwater to the sanitary sewer the Water Quality Control Board states "the possibility exists for industrial stormwater discharges to occur." The Board reiterates in the NPDES permit that "the acute toxicity specifications in the General Shipyard Permit will remain in effect for all industrial stormwater discharges." The required acute toxicity standard for discharge of industrial stormwater is as follows:

> In a 96-hour static or continuous flow bioassay test, the discharge shall not produce less than 90% survival, 50% of the time, and not less than 70% survival, 10% of the time, using a standard test species and protocol approved by the Regional Board.

NASSCO did test a large scale Storm Water Management Inc., StormFilter™ (leaf compost media) filter in the 2001 timeframe. The system was somewhat successful in meeting the acute toxicity standard noted above.

The current stormwater diversion system discharges into the sanitary sewer and has a storage capacity of 33,858,000 gallons, which is well in excess of any standard statistical based storm event capacity such as a 10-year, 24-hour event.

9.5 Norfolk Naval Shipyard

Norfolk Naval Shipyard is located in Portsmouth Virginia and holds NPDES Permit VA0005215 issued by the Virginia Department of Environmental Quality. The Shipyard occupies an approximate 800 acre site. Discharges are primarily into the Elizabeth River with limited discharge into Paradise Creek. Five of

Norfolk's eight dry docks are operational at this time. The permit addresses both dry dock and general yard stormwater discharges. Quarterly stormwater monitoring is required on 6 representative outfalls. It requires capture of the first flush of stormwater, defined as the first one-half inch of rainfall, for vessels with tri-butyl tin (TBT) coating. Vessel non-contact cooling water is not treated.

Toxicity testing is required for both dry dock and stormwater discharges. There are no toxicity limits on non-dry dock discharged stormwater. If results exceed a set benchmark value, Norfolk Naval Shipyard must reexamine the effectiveness of the SWPPP and make changes as necessary.

Although not a direct permit requirement, Norfolk does collect dry dock process water and stormwater for subsequent treatment.

BMPs in the permit that are generally applicable to dry dock (vessel) work include:

> *(1) The permittee shall provide adequate disposal services for all sanitary wastes generated by vessels moored or docked at the permitted facility to remove and dispose of all sewage from the vessels by discharge into the permitted facility's sanitary waste system or other appropriate collection means, in compliance with the Virginia Department of Health Regulations.*
>
> *(2) The affected piers and shoreside support areas shall be cleaned on a regular basis to minimize the possibility that runoff will carry spent abrasives, paints, solvents, cleaners, anticorrosive compounds, paint chips, scrap metal, trash, garbage, petroleum products or other debris into the receiving water. Cleanup of areas contributing runoff shall consist of mechanical or manual methods to sweep up and collect the debris. Mechanical cleanup may be accomplished by mechanical sweepers, front end loaders, vacuum cleaners or other innovative equipment. Manual methods include the use of shovels and brooms.*
>
> *(3) Drydock decks shall be cleaned before flooding or launching, respectively, to prevent the discharge of pollutants to the waterway. They shall also be cleaned on a regular basis so as to prevent rain from washing material into receiving waters. Drydock collection and treatment of storm water and/or wastewater may be effected in lieu of frequent and extensive labor intensive cleanup requirements.*
>
> *(4) Acceptable methods of control shall be utilized during abrasive blasting and spray painting, with the intent of preventing blast dust and overspray from falling into the receiving water. These include the following: downspraying of blast materials and paint; barriers or shrouds beneath the hull; barriers or shrouds between the hull and the wing walls of the drydock; barriers or shrouds hung from the flying bridge to the drydock, from the bow and stern of the vessel, or from temporary structures erected for that purpose. The bottom edge of free hanging barriers shall be weighted to hold them in place during a light breeze. When abrasive blasting vessel superstructures, openings and open areas between decks shall be covered (including but not limited to scuppers, railings, freeing ports, ladders, and doorways) if they allow discharge to State waters.*
>
> *(5) Fixed or floating platforms shall be used as work surfaces when working at the water surface. These platforms shall be used to provide a surface to catch spent abrasive, slag, paint, trash and other debris/pollutants, and shall be cleaned at the end of each work shift.*
>
> *(6) Dust and overspray from abrasive blasting and painting in yard facilities shall be controlled to minimize the spreading of wind blown materials. Frequent cleanup of these areas shall be practiced to prevent abrasive blasting waste from being washed into storm sewers or the adjacent waterway.*
>
> *(7) When water blasting, hydroblasting, or watercone blasting is used to remove paint from surfaces, the resulting water and debris shall be collected in a sump or other suitable device. This*

mixture then will be either delivered to appropriate containers for removal and disposal or subjected to treatment to concentrate the solids for proper disposal and prepare the water for reuse or discharge through an authorized outfall.

(8) When in drydock, all shipboard cooling water and process water shall be directed away from contact with spent abrasive, paint and other debris. Contact of spent abrasive and paint with water will be prevented by proper segregation and control of wastewater streams, unless using suitable wastewater collection systems.

(9) Where possible, water leakage from graving dock gates shall be directed away from contact with spent abrasives, paint and other debris.

(10) The sediment traps in the storm water drainage systems for graving docks and other industrial areas where solid pollutants such as grit blast, paint, and welding slag can accumulate shall be inspected on a monthly basis and cleaned as necessary to ensure the interception and retention of solids entering the drainage system. Inspection logs and cleaning records must be maintained.

(11) During the drydocked period, oil, grease or fuel spills shall be prevented from reaching State waters. Cleanup shall be carried out promptly after an oil, grease or fuel spill is detected. Oil containment booms shall be conveniently stored so as to be immediately deployable in the event of a spill.

(12) Protective measures shall be required for all oil or oily waste transfer operations to catch incidental spillage and drips from hose nozzles, hose racks, drums or barrels.

(13) Oil contaminated materials shall be removed from the drydock areas as soon as possible, and in all cases prior to submersion of the drydock.

(14) The permittee shall prepare and maintain current all plans and contingency documents required by State and Federal laws and regulations addressing oil storage facilities and/or petroleum product spills. These plans shall be retained at the facility for immediate implementation in the event a petroleum spill occurs. Emulsifiers and dispersants are not to be used as agents to facilitate cleanup and/or remediation of petroleum product spills into State waters. The requirements and cleanup referenced above shall also apply to any hazardous substances which may be stored at, and/or transshipped through this facility.

(15) Solid chemicals, chemical solutions, paints, oils, solvents, acids, caustic solutions and waste materials, including used batteries, shall be stored in a manner which will prevent the entry of these materials into State waters. Storage shall be in a manner that will prevent entry into State waters by overfilling, tipping, rupture, or other accidents within the storage area.

(16) All metal finishing chemical solution, caustic wash, and rinsewater tanks shall be stored in such a manner so as to prevent introduction of spills into State waters. Any intercepted chemical spill shall be recycled back to the appropriate chemical solution tank or disposed of. The spilled material must be handled, recycled or disposed of in such manner as to prevent its discharge into State waters.

(17) Drip pans or other protective devices shall be required for all paint mixing and solvent transfer operations, unless the mixing operation is carried out in controlled areas away from storm drains, surface waters, shorelines and piers. Drip pans, drop cloths or tarpaulins shall be used whenever paints and solvents are mixed. Sorbents must be on hand to soak up liquid spills. Paints and solvents shall not be mixed in areas where spillage would have direct access to State waters unless containment measures are employed.

(18) Paint and solvent spills shall be prevented from reaching storm drains or deck drains and subsequent discharge into the water, and shall be cleaned up promptly.

(19) The amount of paint stored in the drydocks or a lighter's floor shall be kept to a minimum.

(20) Trash receptacles shall be provided and maintained on each pier as necessary to prevent trash from entering State waters.

(21) Leaking connections, valves, pipes, hoses and soil chutes carrying wastewater shall be replaced or repaired immediately. Soil chute and hose connections to vessels and to receiving lines or containers shall be tightly connected and leak free.

(22) Shoreside hose testing shall be conducted in a manner to preclude spent abrasives, paint residues, and other debris from entering the river.

(23) Floatable and low density waste such as wood and plastic, as well as miscellaneous trash such as paper, insulation, and packaging, etc., shall be removed from the drydock floor prior to flooding or sinking.

(24) The permittee shall provide adequate disposal services for all oil contaminated bilge and ballast water generated from vessels moored or docked at the permitted facility. Bilge water which has been mixed with industrial wastes shall not be discharged directly to State waters and must be collected, treated and disposed of through a permitted shoreside industrial waste treatment facility, or as appropriate, handled as a hazardous waste as required by Virginia's Solid Waste Regulations.

(25) All vessels that are hauled shall be beyond the normal high tidal zone. In the event of vessel overhang during abnormally high tides, all exterior abrasive/water blasting and coating work on the overhanging portion of the vessel shall be discontinued. Exterior work on vessels will not be in areas that extend beyond the length/breadth of the drydock unless appropriate precautions are taken to prevent discharge of pollutants into State waters.

(26) Docking and launching time intervals shall not be considered as a rationale for not cleaning a drydock

(27) Innovative measures for collecting abrasives may be presented for evaluation.

The permit requires development and implementation of a SWPPP. The SWPPP requirements, which for the most part contain standard/conventional ones, are spelled out in the permit. The permit, however, does include a number of shipyard-specific BMPs:

Pressure Washing Area

When pressure washing is used to remove marine growth from vessels, the discharge water must be permitted as a process wastewater by Part I.A. of this permit.

Blasting and Painting Areas

The plan must consider containing all blasting and painting activities to prevent abrasives, paint chips, and overspray from reaching the receiving water or the storm sewer system. The plan must describe measures taken at the facility to prevent or minimize the discharge of spent abrasive, paint chips, and paint into the receiving waterbody and storm sewer system. The permittee nay consider hanging plastic barriers or tarpaulins during blasting or painting operations to contain debris. Where required, a schedule for cleaning storm systems to remove deposits of abrasive blasting debris and paint chips should be addressed within the plan. The plan should include any standard operating practices with regard to blasting and painting activities. Practices may

include the prohibition of performing uncontained blasting and painting over open water or blasting and painting during windy conditions which can render containment ineffective.

Engine Maintenance and Repair Areas

The plan must describe measures that prevent or minimize contamination of the storm water runoff from all areas used for engine maintenance and repair. The permittee must consider performing all maintenance activities indoors, maintaining an organized inventory of materials used in the shop, draining all parts of fluids prior to disposal, prohibiting wet clean up practice where the practice would result in the exposure of pollutants to storm water, using dry cleanup methods, and/or collecting the storm water runoff from the maintenance area and providing treatment or recycling.

Material Handling Areas

The plan must describe measures that prevent or minimize contamination of the storm water runoff from material handling operations and areas (e.g., fueling, paint and solvent mixing, disposal of process wastewater streams from vessels). The permittee must consider covering fueling areas; using spill and overflow protection; mixing paints and solvents in a designated area, preferably indoors or under a shed; and minimizing runon of storm water to material handling areas. When applicable, the plan must address the replacement or repair of leaking connections, valves, pipes, hoses, and soil chutes carrying wastewater from vessels.

Drydock Activities

The plan must address the routine maintenance and cleaning of the drydock to minimize the potential for pollutants in the storm water runoff. The plan must describe the procedures for cleaning the accessible areas of the drydock prior to flooding and final cleanup after the vessel is removed and the dock is raised. Cleanup procedures for oil, grease, or fuel spills occurring on the drydock must also be included within the plan. The permittee must consider items such as sweeping rather than hosing off debris and spent blasting material from the accessible areas of the drydock prior to flooding and having absorbent materials and oil containment booms readily available to contain and cleanup any spills.

General Yard Area

The plan must include a schedule for routine yard maintenance and cleanup. Scrap metal, wood, plastic, miscellaneous trash, paper, glass, industrial scrap, insulation, welding rods, packaging, etc., must be routinely removed from the general yard area. The permittee must consider such measures as providing covered trash receptacles in each yard, on each pier, and on board each vessel being repaired.

Raw Steel Handling Storage

Describe and implement measures controlling or recovering scrap metals, fines, and iron dust, including measures fro containing materials within storage handling areas.

Paints and Painting Equipment

Describe and implement measures to prevent or minimize exposures of paint and painting equipment from exposure to stormwater.

Metal Fabrication Areas

Describe and implement measures for maintaining clean, dry, orderly conditions in these areas. Use of dry clean-up techniques should be considered in the plan.

Cleaners and Rinse Water

Describe and implement measures to control/cleanup spills of solvents and other liquid cleaners; control sand buildup and disbursement from sandblasting operations; and prevent exposures of recyclable wastes. Environmentally benign cleaners should be substituted when possible.

9.6 Todd Pacific Shipyards Corporation

Todd Pacific Shipyards Corporations (Todd), located in Seattle, holds NPDES permit WA-000261-5 issued by Ecology. Stormwater from an in-use dry dock is collected, treated, and discharged into the sanitary sewer. General yard stormwater is also collected and discharged into the sanitary sewer. The permit specifies capture of a first flush of a storm volume, which equated to the volume from a 10-year 24-hour storm or 3.1 inches of rainfall. The limits in Table 9-2 are in the event of an emergency discharge to surface water. Todd does not allow stormwater to discharge directly into surface water, but collects stormwater primarily in on-site detention tanks and in low-gradient areas of the yard. A mechanical failure involving the detention tanks and/or an extreme rainfall event could lead to an emergency discharge. The driver for collecting stormwater and discharging it into the sanitary sewer was the copper limit. Todd uses floating dry docks so there is no groundwater infiltration associated with their dry dock operation.

Todd elected to discharge into the sanitary sewer as a more viable and lower liability solution than direct discharge. A similar stormwater collection/discharge into the sanitary sewer is generally the approach that both boatyards and shipyards in Washington have chosen when feasible.

BMPs in the permit include:

Control of Large Solid Materials

Floatable and low density waste, such as wood, plastic and miscellaneous trash (such as paper, insulation, and packaging), shall be removed from the drydock floors prior to flooding.

Control and Cleanup of Paint Dust and Abrasive Blasting Debris

Dust and overspray shall be confined to the shipyard repair and construction areas to the maximum extent feasible during abrasive blasting and spray painting of vessels and modules, and other activity that has a potential to result and release of significant quantity of dust and airborne pollutants to waters of the state. Feasible methods of control include conducting the work in a special sandblast/spray paint shed, or plastic barriers around the vessel. Plastic barriers hung from the vessel, or temporary structures around the vessel, should be secure and arranged to prevent the fugitive emissions of abrasive grit and dust, as well as effectively capture overspray from spray painting activities. The bottom edge of tarpaulins and plastic sheeting shall be weighted or fastened to remain in place during a light breeze.

Consideration shall also be given to other feasible innovative procedures as appropriate to improve the effectiveness of controlling dust emissions and paint overspray. Such innovative methods may include wet abrasive blasting (slurry blasting), product substitution for blasting media, e.g., sodium bicarbonate, or overall waste minimization and recycling, e.g., the use of vacuum return sandblasting heads or steel shot blast technology.

No abrasive blasting or spray painting of vessels shall be performed while vessels are docked pier-side such that material is discharged to the receiving water.

Cleanup of spent paint, paint chips, protective coating materials and abrasive grit shall be undertaken as part of the repair or production activities in order to prevent their entry into state waters.

Vessels shall be set on the drydock ways to afford accessibility to the floor of the drydock beneath the vessel for collection of spent abrasive. The drydock shall be cleaned of spent sand blast grit and debris prior to launching a vessel. Cleaning shall be accomplished with manual or mechanical sweeping with vacuuming to remove fine grit and debris into the receiving water.

The flooding and sinking of drydocks with standing piles of spent abrasive on the drydock floor is prohibited.

Photographs shall be taken and maintained in a logbook to demonstrate the condition of the drydock floor prior to launching a vessel. Documentation accompanying the photographs shall include the name of the vessel, the drydock number, the date the vessel was launched, the date the photograph was taken, and the name of the photographer. A videotape that documents the same information may be used in place of a photograph collection.

The yard shall be cleaned with either sweeping or vacuuming as often as it requires to minimize the possibility that stormwater runoff will carry sandblasting grit or other debris into the receiving water. Collected sandblasting debris shall be stored under cover in a designated area with the spent abrasive grit. Innovations and procedures which improve the effectiveness of cleanup operations shall be adopted where they are feasible, appropriate and can be demonstrated as preventing the discharge of solids to water.

In-Water Vessel Maintenance – Surface Preparation BMPs

The cleaning of any portion of a vessel's hull below the waterline while the vessel is afloat is prohibited.

The following types of surface preparation activities are allowed to be conducted on a vessel's hull above the waterline while it is at a permitted shipyard facility. These activities are only allowed provided that containment and collection BMP measures are in effect to prevent the introduction of dust, dirt, debris, or any other pollutants generated from these surface preparation operations from being deposited on or entering into waters of the state:

- *Mechanical hand preparation, such as scraping or wire brushing;*
- *Conventional mechanical grinding or use of other powered mechanical abrading tools;*
- *Innovative abrasive blasting systems or ultra-high water pressure systems for surface preparation will be allowed to be conducted on a vessel's hull while it is in the water provided that it has been demonstrated before-hand to Department of Ecology's satisfaction that such methods do not release generated pollutants into waters of the state.*

In-Water Vessel Maintenance – Paint and Coating Application BMPs:

The following methods of paint and coating applications to a vessel's hull while in the water at a NPDES permitted shipyard are allowed provided that all containment, collection, and spill prevention BMPs are in place before any such applications are made to a vessel's hull:

- *Application by roller;*
- *Application by brush;*
- *Innovative spray-paint or spray-coating application methods will be allowed to be conducted on a vessel's hull while it is in the water provided that it has been demonstrated before-hand to Department of Ecology's satisfaction that such methods do not release generated pollutants into the waters of the state.*

BMPs for Floats used for In-Water Vessel Maintenance:

Floats are defined as free-floating, unattached work platforms capable of moving back and forth along the length of the ship and around its hull.

Floats shall at all times maintain a minimum of 1" of freeboard at the floats lowest point during all phases of maintenance operations. The minimum 1" freeboard requirement must be maintained with all scaffolding configurations and number of persons on board the float. All necessary precautions will be taken by personnel on board the float to prevent paints, cleaning materials, petroleum products, all other liquids and unsecured materials from entering into the water from the float.

Any container of paint, marine coating or any other liquid product for painting or surface preparation of one gallon or greater must be provided with secondary containment when used on board a float. All roller pans used on a float must be provided with secondary spill containment. Secondary spill containment capacity is equal to the entire volume of the container plus 10% of the volume of that same container.

Documentation Requirements for In-Water Vessel Maintenance BMPs

Documentation requirements will be in effect for any in-water surface preparation operations of one hour or more in duration and any in-water coating or painting operation involving ½ gallon or more of paint or marine coating.

Documentation requirements will consist at a minimum of one or more representative photographs of all in-water vessel maintenance BMPs which are implemented for surface preparation operations and all painting and coating operations. All such photographs shall be dated and maintained in a logbook with all necessary descriptive narrative of the in-water vessel maintenance BMPs being documented. These records shall be made available to a Department of Ecology inspector upon request and will be retained on site for at least three (3) years.

Oil, Grease, and Fuel Spills Prevention and Containment

No discharge of oil, other hazardous material, or paint to state waters is allowed, except as specifically authorized by this permit. Oil, grease, fuel, or paint spills shall be prevented from reaching drainage systems or surface waters. Cleanup shall be carried out promptly after an oil, grease, fuel or paint spill is detected. Oil containment booms and adsorbents shall be conveniently stored so as to be immediately deployable in the event of a spill. Yard production personnel shall be trained in shipyard best management practices and basic spill response practices and whom to notify should an accidental discharge of oil or hazardous material occur at the shipyard. The Permittee shall designate a spill response team to be responsible for, and specifically trained in, the use and deployment of cleanup equipment.

In the event of an accidental discharge of oil or hazardous material into waters of the state or onto land with a potential for entry into state waters, the Department's Northwest Regional Office Spill Response Section and the United States Coast Guard shall be notified immediately.

1. Cleanup efforts shall commence immediately and be completed as soon as possible, taking precedence over normal work, and shall include proper disposal of spilled material and used cleanup material.

2. Cleanup of oil or hazardous material spills shall be in accordance with an approved Spill Control Plan, or according to specific instructions of an on-scene coordinator.

3. No emulsifiers or dispersants are to be used in or upon the waters of the state without prior approval from the Director of the Department of Ecology. Drip pans or other protective devices

shall be required for all oil transfer operations to catch incidental spills and drips from hose nozzles, hose racks, drums or barrels. Oils and fuel storage tanks shall be provided with secondary containment.

Paint and Solvent Use and Containment

The mixing of paints and solvents shall be carried out in locations and under conditions such that no spill shall enter state waters.

1. Drip pans or other protective devices shall be required for all paint mixing and solvent transfer operations, unless the mixing operation is carried out in covered and controlled areas away from storm drains, surface waters, shorelines, and piers. Drip pans, drop cloths, or tarpaulins shall be used wherever paints and solvents are mixed on wood docks. Paints and solvents shall not be mixed on floats.

2. When painting from floats or near storm drains, paint shall be in cans of five gallons or less. The paint containers shall be kept in drip pans with drop cloths or tarpaulins underneath the drip pans.

3. Paint and solvent spills shall be treated as oil spills and shall be prevented from reaching storm drains and subsequent discharge into the water.

Contact Between Water and Debris

Shipboard cooling and non-contact cooling water shall be directed as to minimize contact with spent abrasives, paint chips, and other debris. Contact between spent abrasives or paint chips and water will be reduced by proper segregation and control of wastewater streams. Appropriate methods shall be incorporated to prevent accumulation of debris in drainage systems and debris shall be promptly removed to prevent its discharge with stormwater.

Maintenance of Hoses, Soil Chutes, and Piping

Leaking connections, valves, pipes, hoses, and soil chutes carrying either water or wastewater shall be replaced or repaired immediately. Soil chute and hose connections to vessels and to receiving lines or containers shall be tightly connected and as leak free as practicable.

Bilge and Ballast Water

Bilge and ballast water discharges shall not exceed an oil and grease concentration of 10 mg/L and shall not cause any visible sheen in the receiving waters. Monitoring shall be conducted prior to discharge and the results shall be made available upon request.

Bilge and ballast water shall not be discharged to state waters if solvents, detergents, or other known or suspected additives or contaminants have been added, unless a state water quality variance or modification has been granted specific to that instance.

Yard operators are to encourage vessel owners/operators to de-ballast prior to yard repair periods. Oily bilge waters from machinery or pump room spaces are prohibited from discharge to state waters and must be handled accordingly by a waste oil hauler or tank cleaning service.

Chemical Storage

Solid chemicals, chemical solutions, paints, oils, solvents, acids, caustic solutions and waste materials, including used batteries, shall be stored in a manner which will prevent the inadvertent entry of these materials into waters of the state, including ground water. Storage shall be in a manner that will prevent spills due to overfilling, tipping, or rupture. In addition, the following practices shall be used:

1. All liquid products shall be stored on durable impervious surfaces and within bermed containment capable of containing 110% of the largest single container in the storage area.

2. Waste liquids shall be stored under cover, such as tarpaulins or roofed structures. All waste storage areas, whether for waste oil or hazardous waste, shall be clearly designated as such and kept segregated from new product storage.

3. Incompatible or reactive materials shall be segregated and securely stored in separate containment areas that would prevent the inadvertent mixing and reaction of spilled chemicals.

4. Concentrated waste or spilled chemicals shall be transported off-site for disposal at a facility approved by the Department of Ecology or appropriate county health authority in accordance with the solid waste disposal requirements of Special Condition S7. These materials shall not be discharged to any sewer or state waters.

Recycling of Spilled Chemicals and Rinse Water

Any intercepted chemical spill shall be recycled back to the appropriate chemical solution tank or cleaned up and properly disposed of. The spilled material must be handled, recycled, or disposed of in such a manner as to prevent its discharge into state waters.

Identification of Pollutant Sources

The Permittee shall endeavor to identify the sources of pollutants which have not been adequately controlled by the other BMPs of this permit. A sampling and analysis strategy shall be followed which will isolate areas and practices where residual pollutant levels originate that may cause violations of the permit limits. Concentrations of residual pollutants shall be tracked upstream of the discharge point until the sources have been identified.

Education of Employees, Contractors, and Customers

To facilitate the consistent and effective implementation of the BMPs described above, the Permittee shall develop a program for training its employees, and all contractors who work at the facility, on BMPs and the environmental concerns related to this permit. There are a variety of ways to accomplish this and the Permittee should determine the method that works best for the company. For example, regular safety meetings may be a convenient time to discuss BMP implementation successes or problems and get input on better ways of accomplishing pollution prevention. The Permittee may consider providing similar information to its customers.

Sewage and Gray Water Discharges Prohibited

Owners of vessels in the drydocks or under repair dockside shall be notified in writing by the Permittee that federal and state regulations prohibit the discharge of sewage and gray water into the waterways. If untreated sanitary wastes from vessels must be discharged, the discharge shall be to either the sanitary sewer or into holding tanks that are periodically emptied into a sanitary sewer system. The Permittee will make available at all times a list of contractors providing disposal services and any other alternatives available for complying with these regulations, such as holding tanks and pump-out facilities.

9.7 Portsmouth Naval Shipyard

Portsmouth Naval Shipyard is located on a 278-acre site, two-thirds of which is covered by a high-density industrial area, containing 376 buildings. It is located on the southernmost tip of Maine adjacent to the Piscataqua River. Portsmouth Naval Shipyard operates three dry docks.

The most recent NPDES permit, number ME0000868, was issued by the Maine Department of Environmental Protection in May 2006. The permit authorizes discharges from three dry dock outfalls into the Piscataqua River for the following sources:

- Dry dock drainage pumps
- River seepage
- Ground water infiltration
- Stormwater runoff
- Submarine non-contact cooling water
- Steam condensate
- Fresh water freeze protection
- Salt water and fresh water used for ballast tank flushing
- Initial dry dock wash down after dewatering dry dock
- Dry dock dewatering water

The permit limits TSS, Oil & Grease, oil sheen, floating solids, and pH. Flow must be estimated and reported. The permit does not include whole effluent toxicity limitations. As required by the permit Portsmouth Naval Shipyard has a Dry Dock BMP Plan. The BMP plan is for "all work preformed in all shipyard dry docks at the facility, including shipboard work, dry dock operations and maintenance, and dry dock refurbishment. The Plan "shall address, but need not be limited to, dry dock solid waste management and housekeeping, industrial wastewater control and disposition, Hydroblast and high pressure water spray operations, abrasive blast and spray paint operations, ground/river water infiltration and storm water runoff, spills within the dry dock, and dry dock inspections." The permit does not reference or specify specific BMPs that must be included in the BMP Plan.

Discharges of non-dry dock stormwater are not addressed in the above noted permit. Portsmouth Naval Shipyard obtains authorization through EPA's Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity (EPA 2000).

9.8 Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility

Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility is located five miles east of downtown Honolulu on a 112 acre site. The Shipyard operates 4 dry docks. Pearl holds NPDES permit HI 0110230 issues by the Hawaii Department of Health for discharges from the dry docks. The effective date was April 24, 2008. The permit authorizes discharge of hydro-testing water, pump test water, hull wash water, hydroblasting water, cooling water, air conditioner condensate, dehumidifier condensate, dry dock seepage water, and dry dock rain water. The permit limits dry dock stormwater for copper, lead, zinc, turbidity, pH, temperature, chromium, mercury, dissolved oxygen, whole effluent toxicity, and total residual oxidant. Pearl Harbor's permit has a copper limit of 23 µg/l with the provision that it will be raised to 50 µg/l once The State of Hawaii modifies state regulations to include site specific criteria for Pearl Harbor. The permit requires a Dry Dock Water Pollution Control Plan "to minimize the discharge of pollutants associated with operation of the dry dock and to reflect current operations." The permit does not include details of what must be in the Water Pollution Control Plan. The Water Pollution Control Plan is synonymous with a BMP Plan. The permit does not regulate non-dry dock stormwater.

Non-dry dock stormwater is managed via Hawaii Department of Health general permit for industrial activities. The permit requires annual stormwater monitoring at two locations, an annual report to the Department of Health, and implementation of a SWPPP.

Table 9-2: Numeric Permit Limits

Facility	PSNS&IMF	Cascade General Portland Shipyard	Electric Boat Shipyard	NASSCO – General Dynamics	Norfolk Naval Shipyard	Pearl Harbor Naval Shipyard	Portsmouth Naval Shipyard	Todd Shipyard[1]
Pollutant of Concern								
Copper (µg/l)	19 Avg, 33 Max [DD] NS, NL [SW] see Note 3.	230 Max [DD] 100 [SW benchmark]	72 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	335 Max [DD] S, NL [SW]	23 Max [DD] S, NL [SW] see Note 4.	NS, NL [DD] MSGP [SW]	Sanitary sewer [DD] 5.78 Max [SW]
Zinc (µg/l)	NS, NL [DD] NS, NL [SW]	1,000 Max [DD] 600 [SW benchmark]	1400 Max [DD] S, NL [SW]	Sanitary sewer [SW, DD]	765 Max [DD] S, NL [SW]	95 Max [DD] S, NL [SW]	NS, NL [DD] MSGP [SW]	Sanitary sewer [DD] 95 Max [SW]
Temperature (°C), see Note 1.	S, NL [DD]	184×10^9 [DD] see Note 2.	S, NL [DD]	11.1 (20°F) above ambient [DD]	43 Max [DD]	1.0 above ambient [DD]	NS, NL [DD]	NS, NL [DD]
Oil & Grease or TPH (mg/l) see Note 1.	NS, NL [SW]	10 [SW benchmark]	S, NL [SW]	Sanitary sewer [SW]	S, NL [SW]	15 Max [SW]	MSGP [SW]	5 Max [SW]

DD..... Dry Dock: NPDES permit limits associated with dry dock discharges of stormwater
MSGP... Multi-Sector General Permit (EPA, 2000): Coverage for non-dry dock stormwater obtained via the noted permit.
NL ..... Not limited (no permit limit)
NS ..... Not Sampled/monitored
S ..... Sampling/monitoring required
SW ..... Stormwater: Non-dry dock (general yard area) associated discharges.
TPH ..... Total Petroleum Hydrocarbons
L Limit, Permit limit in effect

Note (1): Temperature is a pollutant of concern for dry docks only. Facility limits, if applicable, on non-dry dock stormwater is not addressed in the table. Oil & Grease is a pollutant of concern for non-dry dock stormwater only. Facility limits, if applicable, for dry docks are not addressed in the table.

Note (2): The Cascade temperature limit is expressed as an Excess Thermal Load (ETL) in units of Kcal/day. ETL is calculated, in part, based on the maximum daily temperature and effluent flow. It is conceptually equivalent to a loading limit (lbs/day) for parameters that are concentration based.

Note (3): PSNS&IMF is the only shipyard among those evaluated that collects dry dock discharge samples more frequently than once per month and therefore is the only shipyard with monthly average limits.

Note (4): Pearl Harbor Naval Shipyard's permit has a copper limit of 23 µg/l with the provision that it will be raised to 50 µg/l once the State of Hawaii modifies state regulations to include site specific criteria for Pearl Harbor.

Attachment 4, Permit Limits and Benchmark Analysis, further evaluates the data in Table 9-2.

[1] The Todd stormwater limits in Table 9-2 are in the event of an emergency discharge to surface water. Todd does not allow stormwater to discharge directly into surface water, but collects stormwater primarily in on-site detention tanks and in low-gradient areas of the yard and discharges it into the sanitary sewer.

10 Related Regulatory Evaluation

Along the lines of evaluating facilities similar to PSNS&IMF to help define AKART, this section evaluates general permits that are associated with shipyards or boatyards.

10.1 Ecology Boatyard General Permit

Ecology issued this permit on November 2, 2005 (Ecology 2005). The permit applies to all commercial boatyards in Washington that are "engaged in the construction, repair and maintenance of small vessels, 85% of which are 65 feet or less in length, or revenues from which constitute more than 85% of gross receipts." Ecology issues individual NPDES permits for larger boatyards/shipyards (those exceeding the above noted criteria). The permit contains benchmark values for facilities, which discharge stormwater into marine waters.

If stormwater monitoring results exceed benchmark values, the permit imposes a tiered response. The first tiered response is conducting an inspection and completing actions for reducing levels. The second tier, when additional monitoring results exceed the benchmark levels, is investigating potential stormwater treatment technologies. The third tier is developing an engineering report on the chosen treatment technology and an implementation schedule for installing the treatment technology.

Specific BMPs of note in the permit include:

> *Vacuum Sander – Required of all facilities: A vacuum sander or rotary tool meeting minimum performance standards shall be used for all paint removal where a sander is appropriate. Non-vacuum grinders are prohibited.*
>
> *Solids Management: All particles, oils, grits, dusts, flakes, chips, drips, sediments, debris and other solids from work, service, and storage areas of the boatyard shall be collected to prevent their release into the environment and entry into waters of the state. The minimum collection frequency is once per day when solids-generating activity is occurring. Solids shall be kept as dry as possible during collection and shall not be washed into any surface water or into a stormwater collection system.*
>
> *Marine railways and dry docks shall be cleaned of all solids and garbage prior to being submerged to prevent such materials from being washed into waters of the state. Sediment traps shall be installed in all storm drains to intercept and retain solids prior to their discharge into waters of the state. Sediment traps, storm drains, and catch basins shall be visually inspected weekly and cleaned, either manually or with a vacuum device, on a routine basis to prevent the entry of solids into waters of the state.*
>
> *Oils and Bilge Water Management: Drip pans or other containment devices shall be used during all petroleum product transfer operations to catch incidental leaks and spills. Absorbent pads and/or booms shall be available during petroleum transfer operations occurring over water.*

10.2 EPA Multi-Sector General Permit (MSGP)

The official title of the permit is the NPDES Storm Water Multi-Sector General Permit for Industrial Activities (EPA 2000). EPA reissues the permit roughly every five years. The permit consulted in this report is the October 2000 release. The permit authorizes discharge of stormwater associated with industrial activity for 29 types of industrial operations/facilities (referred to as "sectors"). Sector R is the designation for Ship and Boat Building or Repair Yards. While Sector R imposes specific BMPs, it does not require stormwater monitoring. Sector Q, Water Transportation (a somewhat related industry), requires monitoring and specifies benchmark values for aluminum, iron, lead, and zinc.

The EPA derived benchmark values are from a variety of sources, and they may not be technically applicable for a specific discharge. For instance, the copper benchmark is based on the analytical detection limit. The zinc benchmark is based on the EPA acute aquatic life freshwater water-quality criteria. The copper benchmark is independent of potential aquatic impact, and the zinc benchmark is not applicable to marine discharges.

Specific BMPs, or portions thereof, of note in the permit include:

> *Blasting and Painting Area: Implement and describe measures to prevent spent abrasives, paint chips and over spray from discharging into the receiving water or the storm sewer systems. Consider containing all blasting/painting activities or use other measures to prevent or minimize the discharge the contaminants (e.g., hanging plastic barriers or tarpaulins during blasting or painting operations to contain debris). Where necessary, regularly clean storm water conveyances of deposits of abrasive blasting debris and paint chips. Detail in the SWPPP any standard operating practices relating to blasting/painting (e.g., prohibiting uncontained blasting/painting over open water, or prohibiting blasting/painting during windy conditions which can render containment ineffective).*
>
> *Drydock Activities: Describe your procedures for routinely maintaining/cleaning the drydock to prevent or minimize pollutants in storm water runoff. Address the cleaning of accessible areas of the drydock prior to flooding, and final cleanup following removal of the vessel and raising the dock. Include procedures for cleaning up oil, grease or fuel spills occurring on the drydock. Consider the following (or their equivalents): sweeping rather than hosing off debris/spent blasting material from accessible areas of the drydock prior to flooding, and having absorbent materials and oil containment booms readily available to contain/cleanup any spills.*

General Yard Area: Implement and describe a schedule for routine yard maintenance and cleanup. Regularly remove from the general yard area: scrap metal, wood, plastic, miscellaneous trash, paper, glass, industrial scrap, insulation, welding rods, packaging, etc.

11 Dry Dock Stormwater AKART Analysis

PSNS&IMF uses a multi-level approach for controlling discharge of contaminates from the dry docks consisting of source control, housekeeping, and redirection of contaminated stormwater to the sanitary sewer. All process waters, including at a minimum; hydroblast, pressure-wash, and bilge water is collected, treated, and discharged to the sanitary sewer. The only water discharged in Sinclair Inlet is single-pass non-contact cooling, potable, hydrostatic relief groundwater, and some rain water.

11.1 Source Control

The primary means PSNS&IMF uses for preventing the discharge of pollutants to Sinclair Inlet is source control. PSNS&IMF strives to contain the maximum amount of industrial waste within the work process. This includes 100% containment (along with negative ventilation with a filtered exhaust) of all dry abrasive blasting operations. Also, see Section 7.

Larger paint removal operations are typically conducted in containments with negative pressure ventilation, air filtration, and humidity control with no effective exposure to stormwater. The paint removal mechanism employed is steel grit blasting. Containments are designed for a specific application/location and may be supported by staging, plywood/wood, or attached to existing components such as keel blocks. The containment walls are typically constructed of a heavy industrial grade fabric or shrink wrap. Typically, in this method scaffolding is erected around the work area. Shrink wrap is installed on the outside of the scaffolding to form an enclosed work area. The "floor" may be the existing concrete dry dock floor, industrial fabric, or a plywood floor. The roof can be constructed of shrink wrap, industrial fabric, or a pre-manufactured roof placed atop the scaffolding. The cost of these containments is high, running into the millions of dollars per project. Steel grit blasting is a more technologically advanced and more environmentally protective than open-lance or slag blasting. PSNS&IMF controls both virgin and used blast media to prevent contact with stormwater. Steel grit blasting, in the manner conducted at PSNS&IMF falls above the AKART range.

Water used for hull cleaning and/or paint removal is collected, treated, and discharged to the sanitary sewer. Work practices such as using tarps and covered work areas are used for small metal-working operations such as chipping, grinding, and sanding. These controls meet or exceed the AKART standard.

PSNS&IMF has two work processes, hull-burning and spray painting, where the availability of adequate source control methods is limited. Hull-burning is the process used for recycling decommissioned vessels. During this process an oxy-fuel cutting torch is used to cut the vessels into sections that can be moved from the dry dock to an in-door cutting facility. The BMP for this process is to do as much of the cutting as possible in-doors and clean up the burn slag in the dock. Current practices are consistent with other shipyards and meet the AKART standard.

Spray painting appears to be the largest contributor to copper discharges. PSNS&IMF uses airless paint application and manual application methods, which are standards for the industry. Considering the limited variety of paint application methods used in the industry, airless falls within the AKART range. PSNS&IMF is actively researching emerging spray painting technologies that will reduce the amount of overspray. In addition, the Navy is investigating alternatives for copper-based anti-fouling paints. Currently PSNS&IMF is using rollers or painting in containments where possible. Current practices are consistent with other shipyards and meet the AKART standard.

11.2 Dry Dock Good Housekeeping

The second level of control is inspection and cleaning of the dry docks. PSNS&IMF instructions require that all work areas be cleaned at the end of each shift. See Attachment 3 and Section 15 with regard to

BMPs. Projects working in the dry docks schedule routine cleaning in addition to the end-of-shift cleaning. Project environmental staff inspect the dry docks on a daily basis to ensure compliance. Finally, a staff member of the shipyard's Environmental, Safety, and Health office (Code 106) inspects the dry docks monthly and before flooding with project managers to ensure that cleanliness controls are maintained.

11.3 Redirection of Stormwater Runoff

The final level of control is the PWCS. In summary, this is an innovative system that allows clean dry dock stormwater runoff to drain to Sinclair Inlet while diverting higher turbidity runoff to the sanitary sewer. Fugitive contaminates from the processes described above will accumulate on the dry dock floor and on equipment in the dock. Rain will wash these contaminates into the drainage system. The PWCS uses an on-line turbidity meter to monitor the water running off the dock floor and divert the water to sanitary sewer when the turbidity increases above a background level. A more detailed description of the system is provided below.

The name, "Process Water Collection System" is somewhat of a misnomer. While the PWCS can be used to collect process waters such as hydroblast water, the day-to-day function is collecting and appropriately routing contaminated dry dock stormwater[14]. The PWCS can route stormwater to the sanitary sewer, a service gallery connection allowing the connection of a portable tank, or Sinclair Inlet. Typically, the PWCS discharges higher-turbidity stormwater into the sanitary sewer. The level of "contamination" is determined by on-line turbidity probes. When a defined turbidity level is reached, the controller routes stormwater into the sanitary sewer. Non-"contaminated" stormwater is discharged into Sinclair Inlet via the dry dock drainage systems. The daily volume limit for all dry dock discharges into the sanitary sewer is 400,000 gallons as imposed by SWDP ST-7374. This daily limit to the sewer was recently raised from 260,000 gallons. The increase volume limit has allowed the shipyard to lower the turbidity threshold for water going to the sanitary sewer and, in so doing, reduce the amount of copper discharged to Sinclair Inlet. Figure 4 is a schematic of the PWCS.

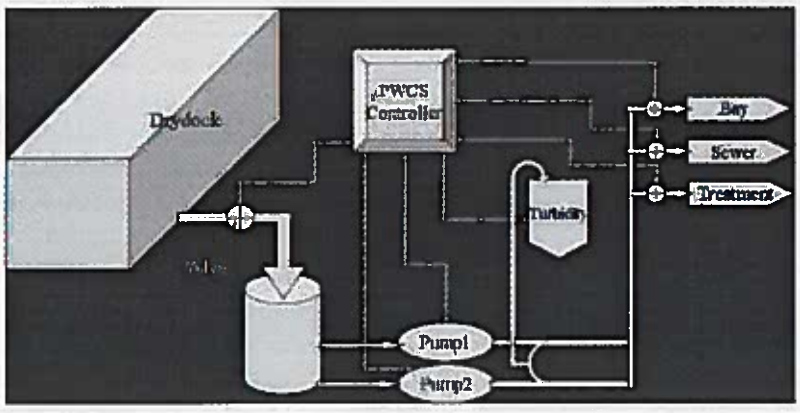

Figure 4: PWCS Schematic

The PWCS pre-treats all water running off the dry-dock floor using settling basins (sediment traps). These settling basins remove the heavier particulates entrained in stormwater prior to discharging the water to Sinclair Inlet or the sanitary sewer. Settling capability varies by dry dock since each is

[14] PSNS&IMF collects and treats all process water from pressure washing and hydroblasting before discharge to the sanitary sewer. During normal operations only storm, potable, ground, and saltwater-firemain water are collected with the PWCS and routed to the bay or sewer.

configured differently. The settling basins are cleaned prior to dry dock "flooding" as part of the pre-flood dock cleaning process.

The ability of the PWCS to control the concentration of copper discharged to the drainage system is based on the correlation of turbidity and copper. PSNS&IMF has extensive data demonstrating this correlation. This data, shown in Figures 5 and 6, indicates that the median copper concentration of water below a realistic control point of 5 NTU is 31 μg/l with 95% of the water samples being below 90 μg/l.[15]

	Total Recoverable Cu (ppb) With a Maximum Turbidity of		
Percentile	5 NTU	8 NTU	10 NTU
50%	*31*	32	33
60%	37	39	39
70%	44	46	47
80%	52	55	58
90%	67	78	86
95%	*87*	100	120
99%	114	160	179
100%	140	190	220

Figure 5: PWCS Cu Concentration Distribution as a Function of Turbidity

[15] During this investigation, PSNS&IMF found that different turbidity meters will give very different readings for process water even when calibrated to the same standards. The readings of the different meters are linearly correlated with each other and with the concentration of copper; however the magnitude of the turbidity readings may differ by a factor of three for the same sample. Based on this information, turbidity works very well for making relative determinations of the amount of copper, but is inappropriate for regulatory limits. The turbidity data used in Figures 5 and 6 were measured in the laboratory.

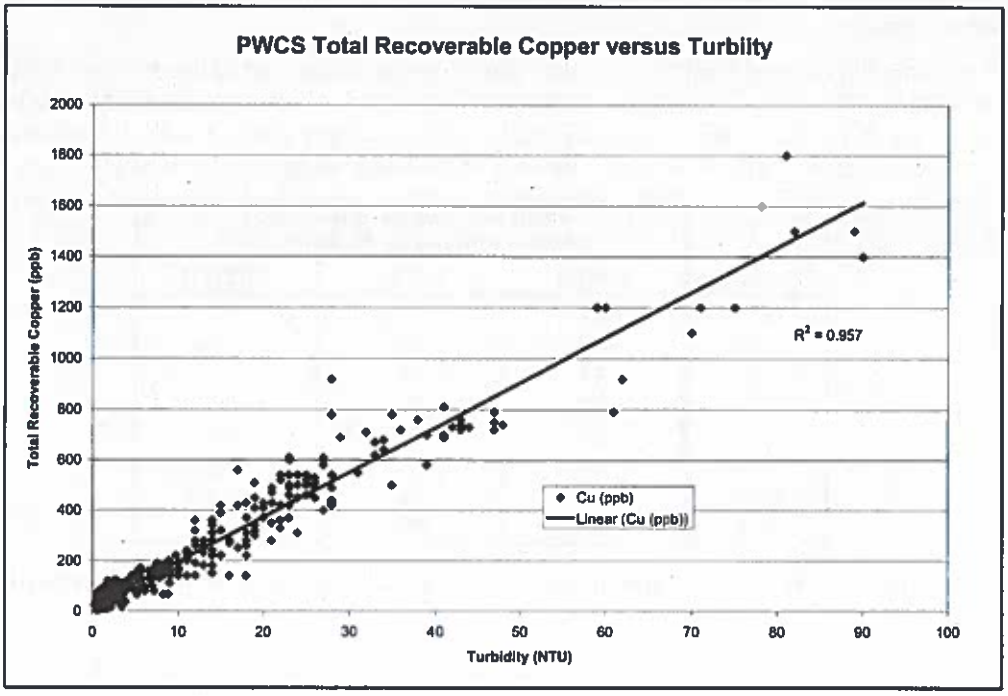

Figure 6: PWCS Cu Data as a Function of Turbidity

In addition to controlling the diversion of water to the sewer, the PWCS provides a relative indication of the effectiveness of the source control and housekeeping BMPs through the measurement of real-time flow rate and turbidity. For example, if a new BMP is instituted and lower storm event turbidity levels are shown, the BMP would be considered successful. If higher flow rates are observed in a dry dock, when it is not raining, it could be due to a leaking hose, which would be corrected. An indication of the effectiveness of the source controls and housekeeping BMPs is that the median copper concentration of the water discharged to the sewer since January of 2004 is only 160 µg/l with 95% of all samples less than 1,000 µg/l.

In addition to controlling the concentration of copper, the capacity of the PWCS must be evaluated on both the instantaneous flow capacity and the volume of water that can be treated per day. The instantaneous capacity is limited by the pumping capacity of the PWCS and the limitations of the PSNS&IMF sanitary sewer system. The daily total capacity is limited by the 400,000 gallons per day limit imposed by the SWDP.

The PWCS is sized to handle storm intensities of at least 1/4 inch per hour as shown in Figure 7.

		Instanteneous Flow Rates (gpm) based on Rainfall Rate (in/hour)					
Dry Dock	Area (sq ft)	0.417	0.208	0.104	0.042	0.021	0.004
1	69000	299	149	75	30	15	3
2	125000	541	271	135	54	27	5
3	120000	519	260	130	52	26	5
4	148000	641	320	160	64	32	6
5	152145	659	329	165	66	33	7
6	224000	970	485	242	97	48	10

Figure 7: PWCS Flow Based on Rainfall Intensity

The daily capacity is more difficult to determine. Ecology typical requires that a stormwater treatment system handle a 10-year, 24-hour storm event, however this standard is not appropriate for a system that treats based on a measured level of concentration of contaminates. The concentration of contaminates varies considerably over the course of a storm. The PWCS has the ability to measure this variability and selectively divert stormwater. The 400,000 gallons per calendar-day to the sanitary sewer allows the PWCS to divert approximately 15% of the volume of water from a 10-year, 24-hour storm. The volume of water that may exceed this sewer limit is, for the most part, determined by the turbidity set point at which the system will divert water to the sewer, however experience has shown that the water that is not diverted to the sewer (based on the sewer capacity limit) is from the tail-end of a storm and the relative concentration of copper is low. PSNS&IMF is seeking to address this limitation by pursuing a military construction project that would connect temporary holding tanks and increasing the size of water treatment systems to handle this excess water however, the PWCS upgrade project has a current estimated cost of approximately $21, 000,000 dollars. It is important to note that new construction on federal facilities above $750,000 requires approval from congress and must appear in the Federal budget. While PSNS&IMF will make every effort to gain Navy and the Congressional approval for this project, PSNS&IMF cannot guarantee success.

11.4 AKART Determination

The combination of source control, housekeeping, and PWCS meets or exceeds AKART as follows.

- The ability of the PWCS to detect and divert contaminated stormwater compares favorably with treatment systems capable of treating the volume of water running off the dock floor during a rain event.
- The system provides feedback on other BMPs and minimizes the quantity of "clean" stormwater discharged to the sanitary sewer.
- PSNS&IMF has chosen to separate process water and treat it separately from stormwater. All process water from pressure washing and hydroblasting is collected and treated. In addition, dry abrasive blasting is fully contained to prevent contact of rainwater with blast debris. During normal operations only storm, potable, ground, and saltwater-firemain water are collected with the PWCS and routed to the bay or sewer. PSNS&IMF has treatment plants capable of handling the high levels of contaminates in process water, but are not sized to handle the large volumes of water with relatively low levels of contaminates found in rainwater runoff. By treating the water with the highest level of contaminates, the total pounds of copper discharged to Sinclair Inlet and sanitary sewer are minimized.

Overall, the PWCS falls within the AKART range. The PWCS are unique for large shipyards. They are a reasonable compromise because, while Cascade General Portland Shipyard (Cascade General, Section 9.1), NASSCO (Section 9.4), Norfolk (Section 9.5), and Todd, (Section 9.6) capture and route all of their stormwater and dry dock water to a POTW, PSNS&IMF does not have access to a POTW that is capable of accepting this much stormwater, and as described in Section 14, installing piping for capturing all of this water and treating it is not economically reasonable. Additionally allowing flooding/ponding of stormwater is not an acceptable option for PSNS&IMF due to the type of work conducted and the structure of the PSNS&IMF graving docks. Another key consideration, in determining AKART, along with the PWCS, is the level of source control in use in the dry docks. The higher the level of source-control, the less stormwater the PWCS will send into the sanitary sewer. In general, PSNS&IMF practices a high level of source control, reinforcing the AKART determination.

11.5 Other Potential AKART Technologies/Practices

This section takes a broader look at PSNS&IMF management of dry dock stormwater to identify and evaluate treatment technologies/methods that might be employed even though current dry dock stormwater management practices already are within the AKART range.

11.5.1 Enclose Dry Docks

Enclosing the dry docks with a permanent or temporary structure has significant appeal from an environmental standpoint. Most stormwater would be diverted and no longer enter the dry docks, minimizing discharge into Sinclair Inlet. The similar facility evaluation, Section 9, showed that no other shipyard has enclosed dry docks, and therefore, if accomplished, would fall above the AKART range. PSNS&IMF has considered enclosing the dry docks a number of times, the most recent in August 2007 (Chuhran 2007). The two enclosure options are retractable buildings and tension fabric structures. The two main limitations of enclosing the dry docks are portal crane access and sufficient clearance for surface ships. Some pros and cons are:

Pros:

- Can be configured to cover entire dry dock floor and vessel
- Allowance for crane movements
- Allowance for temporary services and personnel access
- Foundation and railing can be permanently installed reducing set up time after vessel has been docked

Cons:

- Enclosure of surface vessels poses technical challenges due to their height
- Sections will need to be removed during docking/undocking operations
- Tension Fabric Structure section disassembly/reassembly is difficult and time consuming
- Crane access may slow production efficiency
- A limited amount of stormwater will still enter the dry docks

A separate engineering study would be required to estimate the cost of enclosing the dry docks. However, given that the largest covered dry dock in the world, (Helsinki Shipyard) covers an area less than half of what would be required for Dry Dock 6 alone, (100,100 ft^2 vs. 212,400 ft^2), this is probably not a viable option at this time.

PSNS&IMF has a multi-faceted approach to dry dock pollution control. Enclosures and containments are one major aspect and PWCS being another. These two work in conjunction to achieve the same endpoint as enclosing the whole of the dry dock. PSNS&IMF will continue to optimize pollution control using the multi-faceted approach.

11.5.2 Upgrade the PWCS

PSNS&IMF has a number of PWCS upgrades and related projects under development that will increase efficiency. Already noted is the increase of the sanitary sewer daily volume limit from 260,000 to 400,000 gallons.

PSNS&IMF is replacing the existing typical 50 gpm OWTS units with new 200 gpm rated units. Two new units have been ordered and will be installed in fiscal year (FY) 2008. Figure 8 shows the location of new OWTS units and the currently scheduled installation year. The long term plan is to connect the OWTS units and 11 existing 40,000 gallon storage tanks to the PWCS as shown in Figure 8. These upgrades will greatly increase the capacity and efficiency of the PWCS. Benefits will include:

- PWCS effluent can be discharged into an OWTS for treatment. The 200 gpm processing capacity makes this more possible then with the previous 50 gpm OWTS units. OWTS effluent can be discharge into the sanitary sewer; or perhaps in the future, with approval, it could be routed back into the dry dock drainage system. This would decrease the burden on the sanitary sewer.
- The additional storage capacity adds buffer capacity when treatment is anticipated. The tanks will act to mitigate surge volumes so OWTS can proceed uninterrupted and efficiently.
- For extreme storm events, PWCS volume in excess of 400,000 gallons may be stored in tanks for discharge at a future day. Currently, volume in excess of the daily limit is discharged into the dry dock drainage system.
- The PWCS controller could be programmed for a multi-tiered discharge scenario. At low turbidity levels, as currently configured, the PWCS would continue to discharge into the dry dock drainage system. At intermediate turbidity levels, the PWCS would discharge to the sanitary sewer. At high levels, the PWCS would discharge to the OWTS. This multi-tiered approach would be more protective of Sinclair Inlet. An additional benefit is an effective higher volume limit to discharge into the sanitary sewer as the OWTS is counted separately from PWCS volume limit.
- The new piping configuration will allow greater wastewater and spill response opportunities. For example if pressure washing of the dry dock floor was required, the PWCS could be configured to discharge into the OWTS without the need of temporary hoses and tanks. If a large liquid spill were to occur in dry dock and it was discovered quickly, the PWCS could be configured to direct the spill into a tank.

Note: The PWCS upgrade project has an estimated cost of approximately $21,000,000. It is important to note that new constitution on Federal facilities above $750,000 requires approval from congress and must appear in the Federal budget. While PSNS&IMF will make every effort to gain Navy and the Congressional approval for this project success cannot be guaranteed.

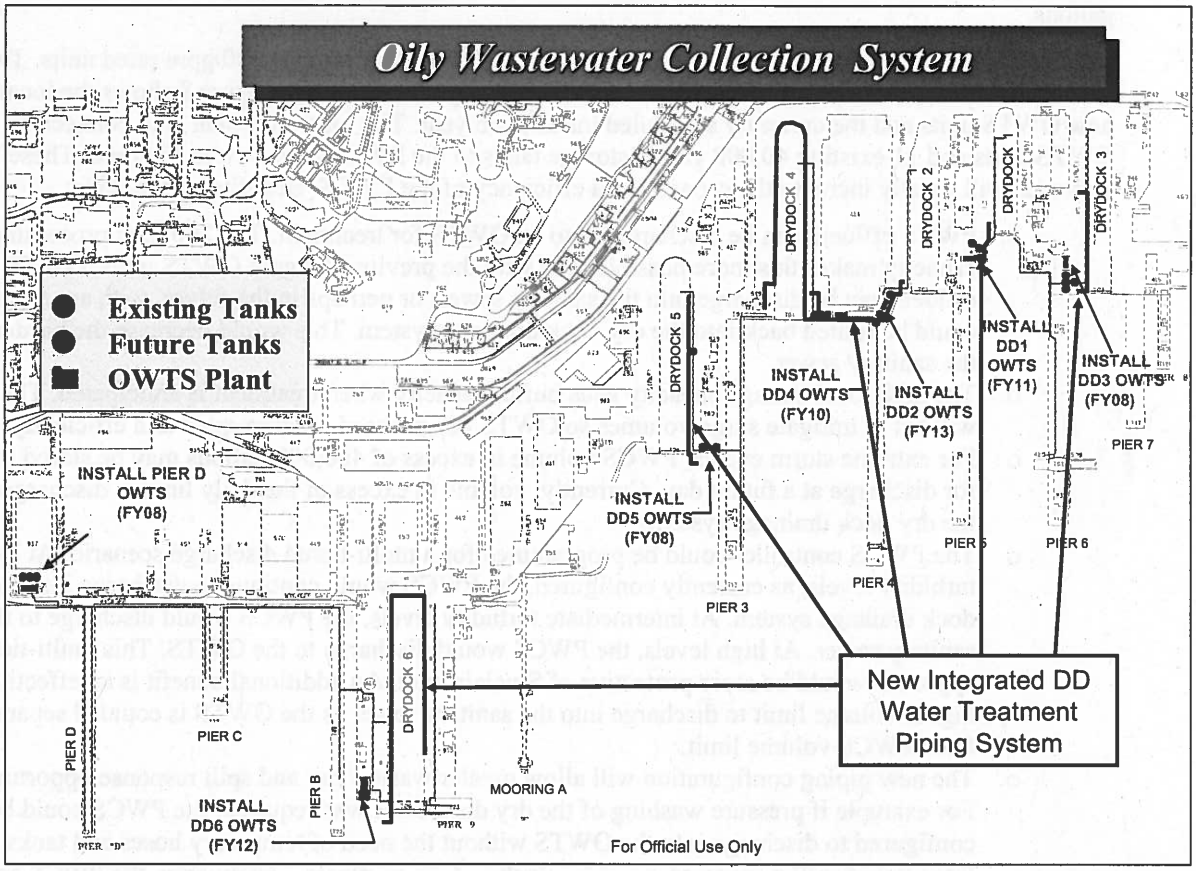

Figure 8: PWCS and OWTS Integration

Other PWCS related upgrades are:

- Increase reliability and capacity of the sanitary sewer system. Since the PWCS discharges into the sanitary sewer reliability and capacity issues directly impact the effectiveness of the PWCS.
- Reconfigure the dry dock drainage system to enhance flow characteristics and maintainability, and eliminate water currently bypassing the PWCS.

12 Dry Dock Cooling Water and Groundwater AKART Analysis

12.1 Background

This section of the AKART Study will evaluate PSNS&IMF's current practices concerning groundwater and cooling water and determine their AKART status. If they do not achieve the AKART standard, this section will evaluate how to meet AKART. Section 4.0 outlines the AKART evaluation process. One driver in including the cooling and groundwater in the AKART study was the EPA Working Draft NPDES Permit (EPA 2008) which proposes dry dock outfall discharge limits of 2.4 µg/l copper and 16° C. While both of the proposed limits are water quality based and not a direct consideration in evaluating AKART the limits do warrant a close look to determine the current AKART status.

At PSNS&IMF water that is directed to the dry dock floors such as, hull wash water to remove salt deposits, and other miscellaneous discharges such as steam condensate and freeze protection are collected via sumps on the dry dock floors. The sumps discharge into the into the dry dock drainage system, which is a system of culverts/tunnels for draining the water to Outfalls 018A, 018B, 096, and 019. Outfalls 018A, 018B, 096 serve dry docks 1 through 5. Outfall 019 serves Dry Dock 6. The water pumped into Sinclair Inlet via dry dock outfalls is mainly dry dock hydrostatic relief groundwater and vessel once through non-contact cooling water.

For Outfalls 018A, 018B, 096, and 019 the combined daily flow of each type of water is as follows: 7 million gallons of groundwater average, 13.5 million gallons of cooling water maximum, and an average of 169,000 gallons of mainly dry dock stormwater.

12.2 Dry Dock Hydrostatic Relief Groundwater

PSNS&IMF's six dry docks are fixed concrete structures, with lengths between 650 and 1,150 ft, and widths between 108 and 190 ft (also see Table 1-1). The dry dock floor elevations range from about 20 to 49 ft below sea level (mean lower low water). All six dry docks are oriented in a north-south direction along the north shoreline of Sinclair Inlet, see Figure 1. The south ends of dry docks 1 through 5 are either in line with or set back from the shoreline. Eighty percent of Dry Dock 6 protrudes into Sinclair Inlet. In order to maintain the structural integrity of the dry docks, fresh and saline groundwater that might exert pressure on the dry dock's walls and floors, is, by design, drained to relieve that pressure. Behind the walls and floors are drain pipes and rock drainage courses to achieve this end with the exception of Dry Dock 2, which due to its design does not need to relieve groundwater to maintain structural integrity.

The groundwater from this hydrostatic relief system discharges into longitudinal collection culverts. Some culverts are underneath the dry dock floors and some are built into the base of the sidewalls. Figure 9 shows how the Dry Dock 6 hydrostatic groundwater relief system works. For dry docks 1 through 5 groundwater from these longitudinal culverts discharges into an east-west tunnel located underneath the floors of the dry docks. Groundwater inside this tunnel drains by gravity to one or two of three main pumping stations (referred to as a pumpwells) and is pumped to Sinclair Inlet via Outfalls 018A, 018B, or 096. Groundwater from Dry Dock 6 discharges to an east-west tunnel that discharges to a pumpwell that pumps into Sinclair Inlet via Outfall 019.

Based on historic outfall flowmeter readings, on days when there is little flow from vessel cooling water, the combined Outfall 018A, 018B, and 096 groundwater flow is about 2.5 million gallons per day. The Outfall 019 groundwater flow is about 4.5 million gallons per day.

12.2.1 Groundwater Quality and Historic Practices

Most of the PSNS&IMF industrial areas were created through many filling operations. The filling periods were 1891 to 1914, 1914 to 1922, 1922 to 1933, 1933 to 1946, and 1958 to 1963. (URS 2002) Some of the fill material was soil from on-site construction activities, sediment dredged from Sinclair Inlet, and industrial waste generated at the Shipyard, such as spent abrasive grit, asphalt, concrete, wood, metal scraps and shavings, and paint and paint chips. Due to these historical fillings the PSNS&IMF industrial areas are parts of the BNC Superfund site Operable Unit B (OU B). The pollutant of concern associated with groundwater is copper, which may be attributed to copper slag (an abrasive blast grit containing copper) in the fill, sandblast grit, and industrial fill (URS 2002). According to the Final Remedial Investigation Report (URS 2002) one of the primary mechanisms of chemical transport from the shipyard to Sinclair Inlet is through groundwater movement, and specifically by groundwater passing through the dry dock hydrostatic relief system.

As the groundwater moves through the soil, compounds have the potential to dissolve into the groundwater. The continuous pumping of the dry dock groundwater hydrostatic relief system creates a low pressure zone around the dry docks and thereby draws a large amount of seawater into the soils around the dry dock. The groundwater from the shipyard industrial areas mixes with this seawater and is drawn to the dry dock hydrostatic relief system and is pumped to Sinclair Inlet. As much as 70 percent of Outfall 019's discharges is seawater (USGS 1995). Pollutant concentrations in groundwater are typically many times lower than the concentrations in soil. In addition, the groundwater is then mixed with considerable amounts of seawater in the soils around the dry dock. Copper concentrations in hydrostatic relief groundwater, based on risk evaluated as part of the PSNS&IMF OU B investigation, do not pose a threat to the marine environment. The Final Remedial Investigation Report (URS 2002) states:

> "When the drydocks are operating (the normal situation), most site groundwater is drawn into the drydock relief drainage systems, mixing with large volumes of seawater in the process of passing through nearshore soils. This mixed relief drainage water, including any chemicals present in the groundwater portion, is eventually discharged to the inlet. Although this pathway involves comparatively large flow rates, the low chemical concentrations found in the mixed discharge water suggest that drydock discharges do not pose a threat to the marine environment."

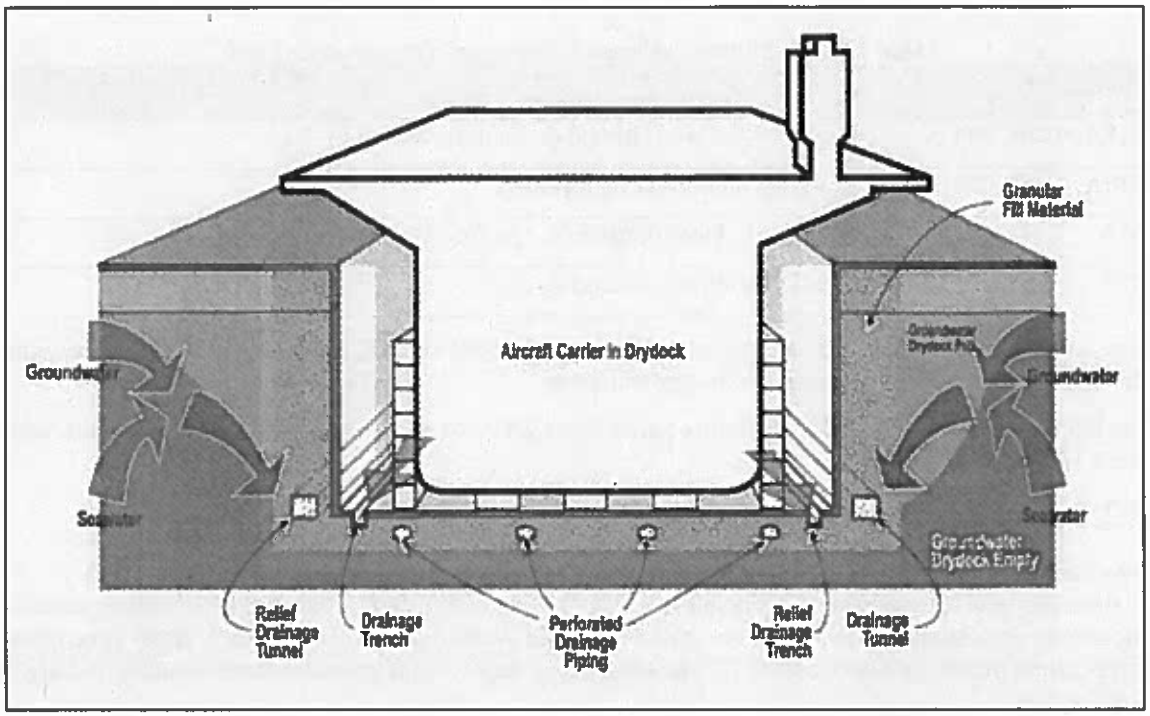

Figure 9: Dry Dock 6 Groundwater Hydrostatic Relief System

12.2.2 Vessel Non-Contact Cooling Water

Nuclear Powered Naval vessels require large volumes of single pass non-contact cooling water while in dry dock to maintain critical system cooling, to provide emergency startup capabilities, and to provide cooling for safe working conditions. Examples of ship systems with heat exchangers include emergency diesel generator, propulsion plants, and air-conditioning plants. Cooling water is supplied by the PSNS&IMF saltwater fire main system, which withdraws water from Sinclair Inlet.

While in contact with the ship heat exchangers, thermal energy is transferred to the cooling water. The cooling water is then discharged to the dry dock drainage system (via the dry dock side tunnels/culverts or underground culverts.) It is then discharged to Sinclair Inlet via one of the noted NPDES permitted dry dock outfalls, after comingling with other waters in the dry dock drainage system. Submarines discharge between 500 and 2,000 gpm of cooling water (depending on its class) while a typical carrier discharges between 4,100 and 6,500 gpm of cooling water. The difference in temperature from influent to effluent is usually between 5.6° C and 8.3° C. The temperature of Sinclair Inlet varies between 5.6° C and 16.7° C. In the summer, the temperature of cooling water exiting the ship may be as high as 25° C.

12.2.3 Combined Cooling Water and Groundwater Information

Ship non-contact cooling water is routed into the dry dock side tunnels/culverts, which are parts of the dry dock drainage system. In these culverts, the non-contact cooling water commingles with the dry dock hydrostatic relief groundwater and then flows to a dry dock pumpwell prior to discharge via one of the dry dock outfalls. Outfall flow varies based on the number of vessels in dry docks and based on the volume of cooling water generated. Table 12-1 shows the extremes of combined vessel non-contact cooling water and dry dock hydrostatic relief groundwater flow.

Table 12-1: Extreme Combined Cooling and Groundwater Flow

Outfall	Flow Description	Flow (MGD)
018A, 018B, 096	High Daily Flow (Ground & Cooling Water)	7.1
018A, 018B, 096	Low Daily Flow (Groundwater)	2.5
019	High Daily Flow (Ground & Cooling Water)	13.6
019	Low Daily Flow (Groundwater)	4.5

The low daily flow occurs on days without discharge of vessel cooling water and all water contribution to the outfall comes from hydrostatic relief groundwater.

Outfall 018A, 018B, and 096 temperature varies from 9.8° C to 18.2° C. Outfall 019 temperature varies from 10.8° C to 16.7° C.

12.3 Regulatory Information

The current PSNS&IMF NPDES permit authorizes discharge of non-contact cooling water and hydrostatic relief groundwater to Sinclair Inlet via Outfalls 018A, 018B, 096 and 019. Temperature is monitored on a monthly basis but there is no limit. The Working Draft Permit (EPA 2008) specifies a temperature discharge limit of 16.0° C. The monitoring requirement increases from monthly to daily. See Section 5.0

The current PSNS&IMF NPDES permit requires weekly monitoring of dry dock outfalls for copper. The monthly average and daily maximum copper concentration limits are 19 µg/l and 33 µg/l respectively for outfalls 018A, 018B, 096, and 019. The Working Draft Permit proposes final copper effluent limits of 2.4 µg/l for the average monthly and 5.8 µg/l for the maximum daily for outfalls 018A, 018B, and 096. For outfall 019, it specifies a final average monthly copper effluent limit of 2.5 µg/l and a maximum daily limit of 5.8 µg/l.

12.4 Existing Effluent Data

This section characterizes the combination of dry dock vessel non-contact cooling water and dry dock hydrostatic relief groundwater. As described above, on any given day the dry dock outfall effluent could be comprised of hydrostatic relief groundwater, vessel non-contact cooling water, and dry dock stormwater. On average about 15% of the higher turbidity dry dock stormwater is diverted to the sanitary sewer via the PWCS. Therefore, on average 85% of the dry dock stormwater is considered clean and is diverted to the dry dock drainage system and pumped to Sinclair Inlet along with vessel cooling water and hydrostatic relief groundwater. On a non-rain day, the outfall effluent includes mostly vessel cooling water and hydrostatic relief groundwater. Therefore, by evaluating historic outfall data during periods when there is a vessel in dry dock and when there was no rain, the copper level in the combined vessel cooling water and hydrostatic relief groundwater could be determined. Data with circumstances of potential contaminations due to the PWCS not working correctly or when certain types of maintenance work were underway were not considered.

Five years of outfall data (January 2003 to December 2007) was used for this evaluation. For outfalls 018A, 018B, and 096, 178 weekly samples were from non-rain days. Sixty nine (69) percent of these samples are below the copper detection level of 10 µg/l. The maximum copper concentration of these samples was 33 µg/l. Table 12-2 below illustrates these results.

Table 12-2: Outfalls 018A, 018B, 096 Non-Rain Day Samples

Parameter	% Below Detection Level of 10 µg/l	Median	Maximum	Estimated Average
Copper (µg/l)	69%	ND	33	12
Note: ND means Non-Detected at detection level of 10 µg/l. The average value could not be directly calculated due the detection level issue. It was conservatively estimated by assuming all ND values are at the 10 µg/l detection level.				

For Outfall 019, 57 weekly samples were from non-rain days. Eighty one (81) percent of these samples were below copper detection level of 10 µg/l. The maximum concentration was 25 µg/l. Table 12-3 below illustrates these results.

Table 12-3: Outfall 019 Non-Rain Day Samples

Parameter	% Below Detection Level of 10 µg/L	Median	Maximum	Estimated Average
Copper (µg/l)	81%	ND	25	11
Note: ND means Non-Detected at detection level of 10 µg/l. The average value could not be directly calculated due the detection level issue. It was conservatively estimated by assuming all ND values are at the 10 µg/l detection level.				

Table 12-4 below provides the combined outfalls 018A, 018B, 096, and 019 effluent data for non-rain days. Based on these results, the combined dry dock vessel cooling water and hydrostatic relief groundwater average concentration is 12 µg/l copper with maximum concentration of 33 µg/l copper.

Table 12-4: Combined Outfall Non-Rain Day Samples

Parameter	% Below Detection Level of 10 µg/l	Median	Maximum	Estimated Average
Copper (µg/L)	72%	ND	33	12
Note: ND means Non-Detected at detection level of 10 µg/l. The average value could not be directly calculated due the detection level issue. It was conservatively estimated by assuming all ND values are at the 10 µg/l detection level.				

Concerning temperature, over the period between January 2003 and December 2007, Outfalls 018A, 018B, and 096 temperatures varies from 9.8° C to 18.2° C, and Outfall 019 temperature varies from 10.8° C to 16.7° C, based on monthly outfall effluent data. Outfalls 018A, 018B, and 096 (dry docks 1 through 5) would have exceeded the proposed water quality-based temperature limit of 16° C, 14 out of 60 months or 23% of the time. Outfall 019 (Dry Dock 6) would have exceeded the proposed temperature limit 4 out of 60 months or 7% of the time. The exceedences would have happened in the summer, generally between June and October, when the Sinclair Inlet surface temperature are as high as 16.6° C. Table 12-5 illustrates these data.

Table 12-5: Outfalls 018A/018B/096 and 019 Temperature

Parameter/Outfall	Percent Above Proposed Temperature Limit of 16° C	Median	Maximum	Average
Temperature/018A, 018B, 096	23%	13.9	18.2	13.9
Temperature/019	7%	12.7	16.7	13.1

12.5 Current Management Practices

Vessel once through non-contact cooling water is supplied by the PSNS&IMF saltwater fire main system, which withdraws water from Sinclair Inlet. Once the cooling water exits the vessels in dry dock it is routed via temporary hoses to the dry dock drainage system to prevent contact with debris on the dry dock floor. PSNS&IMF Instruction P5090.30 requires the cooling water to be routed to the dry dock drainage system within one week of docking a vessel. For aircraft carriers, two weeks are needed due to the additional time it takes to route the numerous sources of cooling water. Once routed to the drainage system, the cooling water commingles with dry dock hydrostatic relief groundwater prior to discharge to Sinclair Inlet via one of the dry dock outfalls.

The dry dock hydrostatic relief groundwater discharges directly into the culverts or tunnels underneath the dry dock floor or at the base of the dry dock side walls. These culverts/tunnels then discharges into the tunnel system running east-west that discharges to Sinclair Inlet via the dry dock outfalls (this underground culvert/tunnel system is referred to as the Dry Dock Drainage System).

12.6 Similar Facility Evaluation

Per Ecology guidelines (Ecology 2006a), one method of defining AKART is by evaluation of similar facilities. For vessel cooling water and dry dock hydrostatic relief groundwater the following medium to large size facilities were evaluated. All shipyards discharge cooling water without treatment. Large shipyards, particularly those servicing nuclear powered ships, discharge significantly higher volumes of cooling water due to the number and type of vessels. General information on these facilities is provided in Section 9.

12.6.1 Norfolk Naval Shipyard

At Norfolk Naval Shipyard vessel cooling water is routed outside the dry dock and combines with the dry dock hydrostatic relief groundwater prior to being discharged to the Elizabeth River per their NPDES permit VA0005215. There is no limit for temperature. Copper is required to be monitored once a year. The discharge limit for copper is 335 µg/l. Norfolk's permit allows miscellaneous discharges associated with vessel repair activities conducted in the dry docks, including stormwater runoff, to combine with the cooling water and hydrostatic relief groundwater in the dry dock drainage system prior to being discharged to the river. However, Norfolk elected to collect process water and stormwater in the dry dock for treatment, except during a major rainstorm. Under the current permit, Norfolk Naval Shipyard does not collect their vessel cooling water or their dry dock hydrostatic relief groundwater for copper treatment or temperature reduction.

12.6.2 Cascade General Portland Shipyard

At Cascade General Portland Shipyard, non-contact cooling water is discharged from four outfalls in two dry docks. Each dry dock has two outfalls from which non-contact cooling water can be discharged. The

non-contact cooling water is not limited in terms of temperature, but in terms of heat load. The limit at each outfall is 184 X 10^6 Kcal/day (daily maximum). This is equivalent to 15° F higher than surface water temperature for 11.6 MGD at each of the two dry docks. Concerning dry dock hydrostatic relief groundwater Cascade General's NPDES permit OR002294-2 does not mention it.

12.6.3 National Steel and Shipbuilding Company

Per NASSCO's existing NPDES permit No. CA0109134, dry dock hydrostatic relief groundwater is limited for temperature. The discharge can not be more than 20° F greater than background/ambient temperature of receiving waters. NASSCO does not have a problem meeting this limit. Currently, there is no treatment of dry dock hydrostatic relief groundwater for copper removal or to reduce temperature. There is no mention of vessel cooling water in NASSCO's permit.

12.6.4 Todd Pacific Shipyards Corporation

Per NPDES permit WA-000261-5, Todd Pacific Shipyards Corporation does not have any hydrostatic relief groundwater. They have floating dry docks. Concerning non-contact cooling water the permit requires that shipboard cooling water shall be directed as to minimize contact with spent abrasives, paint chips, and other debris, but there is no temperature limit.

12.6.5 Pearl Harbor Naval Shipyard

Pearl Harbor Naval Shipyard holds NPDES permit HI0110230 issued by the State of Hawaii Department of Health. Dry dock hydrostatic relief groundwater (seepage water) and vessel cooling water are commingled with other dry dock process water such as pump test water, hull wash water prior to discharge via the dry dock outfalls. For the dry dock's discharge, the temperature cannot be higher than 1° C from ambient condition. During the last year Pearl Harbor Naval Shipyard exceeded its temperature limit 25% of the time (per telephone conversation with Richard Tanaka at Pearl Harbor Naval Shipyard's Environmental Office). The interim copper discharge limits is 23 μg/l. Currently, there is no copper removal treatment or temperature reduction effort on the hydrostatic relief groundwater or vessel cooling water.

12.7 AKART Analysis

As can be seen from the management methods at other similar facilities listed above, shipyards do not divert large volume of hydrostatic relief groundwater to the sanitary sewer or treat the groundwater to remove copper. This is because hydrostatic relief groundwater is:

- Generally a large volume discharge and sanitary sewer systems are not built it.
- There has been no discharge permit requiring its treatment.
- There is no commercially available technology capable of treating large volumes of water to remove copper in the part per billion range. See Section 12.7.5 below.

Concerning vessel non-contact cooling water, the facilities surveyed do not have diversion to the sanitary sewer, any copper removal treatment, nor any temperature reduction treatment for their non-contact cooling water prior to discharge. Similar to hydrostatic relief groundwater, the reason for this is because of the large volume of discharge, the high cost of any temperature reduction, and most shipyards are able to meet their discharge limits.

Therefore, considering that the shipyards evaluated do not currently provide any treatment for copper removal or temperature reduction for dry dock hydrostatic relief groundwater and vessel non-contact

cooling water, the current practice at PSNS&IMF of discharging these waters to Sinclair Inlet without treatment falls within the AKART range.

Since PSNS&IMF is already meeting AKART, no additional treatment or management method needs to be implemented. However, if a pollutant control management methods or treatment that could be easily implemented and is reasonable economically, then it should be considered. The sections below provides information on other treatment options, associated costs, their impact to operations, and potential for implementation based on economic reasonableness.

12.7.1 Treatment Technologies for Temperature

The Working Draft Permit (EPA 2008) proposes a water quality-based temperature limit of 16° C. Over the period between January 2003 and December 2007 Outfall 018A, 018B, and 096 temperature was as high as 18.2° C and exceeded 16° C level 23% of the time. Outfall 019 temperature was as high as 16.7° C and exceeded 16° C 7% of the time.

In order to lower the temperature of the outfall discharges to below 16° C PSNS&IMF evaluated treatment of the once-through non-contact cooling water by evaporative cooling towers and chillers to below 16° C prior to its commingling with hydrostatic relief groundwater in the dry dock drainage system. The hydrostatic relief groundwater temperature should be similar to Sinclair Inlet water temperature, and should already be below 16° C most of the time except in the summer. Therefore, reducing the temperature of the non-contact cooling water alone should be enough to ensure the temperature of the outfall discharge will be below 16° C.

PSNS&IMF is also pursuing cooling water reduction initiatives with fleet customers. If it is acceptable from a vessel system designs standpoint, PSNS&IMF will reduce the amount of cooling water for some systems. In addition, PSNS&IMF is studying using small heat exchangers for to cool small volume systems that now use once-through cooling.

12.7.2 Vessel Cooling Water Treatment - Evaporative Cooling Towers

In an evaporative cooling tower, a small portion of the water being cooled is evaporated by coming into contact with air from the atmosphere. This provides cooling to the rest of the water. The heat load is transferred to the air in the atmosphere. There are two site-specific problems with this technology. One problem is with the wet-bulb temperature, which is the lowest temperature an object may be cooled by the process of evaporation. The wet bulb temperature for the Seattle area is as high as 19.4° C in the summer. The best cooling tower can only lower the temperature of water to within 1.7° C higher than the wet bulb temperature of the area. For Bremerton, in the summer, the best a cooling tower can do is reducing the temperature of the vessel cooling water to 21.1° C. This would not meet a discharge limit of 16° C.

The second problem with using cooling tower for vessel cooling water is that it is not practical. Vessel cooling water is saltwater from Sinclair Inlet. Evaporative cooling is not practical for removing heat from saltwater because the high mineral and salt loading present in saltwater would rapidly deposit onto the tower packings, thus rendering them ineffective. The tower packing would turn into a block of salt in a short amount of time. Due to these two problems, cooling towers are ruled out as a treatment technology to reduce the temperature of vessel cooling water. A related option would be to use cooling towers but have a closed loop system using non-saltwater. This would minimize the matter of salt buildup, however, a new pumping system would be required, and there would be a significant wastestream of blowdown to manage.

12.7.3 Vessel Cooling Water Treatment - Chillers

A chiller removes heat from a liquid via refrigeration. As described above, in order to ensure that the dry dock outfall discharges, which comprise mostly vessel cooling water and dry dock hydrostatic relief groundwater, would meet the water quality-based temperature limit of 16° C PSNS&IMF would need to reduce the temperature of vessel cooling water to 16° C prior to its commingling with hydrostatic relief groundwater.

The temperature of Sinclair Inlet water varies between 5.6° C and 16.7° C. After coming into contact with the heat exchangers in the ships the cooling water may pick up 8.3° C. Then, the temperature of vessel cooling water may be as high as 25° C in the summer. Limited temperature data at dry dock outfalls indicates that co-mingled water leaving dry dock discharge points is generally 16° C or cooler with a few exceptions in August and early September each year. Maximum temperature from dry dock outfalls is 18 ° C. For dry docks 1 through 5 the chiller option is to collect 100% of all vessel cooling water and send it through chillers located at each dry dock to reduce the temperature from a maximum of 25° C to 16° C. The maximum cooling water flow per dry dock is 1,100 gpm based on the highest required cooling flow from a submarine. A 1,100 gpm flow with a reduction of 9° C will require 780 tons of chiller. Two 400 tons chillers would be used. They would require a foot print of 18 ft. X 64 ft. The capital cost per dry dock is $700,000. The monthly operating cost per dry dock is $84,000. Eight (8) chillers total will be required for Dry Docks 1 through 5. Dry Dock 3 is only used for vessel recycling projects and therefore cooling water is not required.

For Dry Dock 6, 100% of cooling water, which is approximately 6,500 gpm, would be captured and pumped to a 4,600 ton chiller located topside of the dry dock. Approximate footprint for the chiller is 70 ft. X 60 ft. A 7,000 KW power system is required to operate the chiller at 4,160 volts. A 250 horsepower motor and pump is needed to bring the cooling water from the bottom of the dry dock to the chiller at street level. The total estimated capital cost for Dry Dock 6 is $4.8 million. The monthly operating cost is $515,000.

For this option, the estimated capital cost for all six dry docks is $7.6 million. The monthly operating cost for all six dry docks is $850,000. See Attachment 2 for the Scoping Estimate of this option. In addition to the high cost of this option, there is also the concern with the physical size of these chillers and pumps. It will take up a lot of space topside of the dry docks or piers, space that are not available due to critical crane operations and loading and unloading operations around the dry docks. Overall, given the high cost, critical space constraints, and the expectation of relatively few excursions above 16.0° C this option is not reasonable from an economic reasonableness standpoint.

12.7.4 Cooling Water Reduction Initiatives

PSNS&IMF is pursuing cooling water reduction initiatives with fleet customers as a result of this study. The first initiative is to reduce designed flow rate to required flow rate. PSNS&IMF engineers have been calculating the required flow rates for various ship heat-exchange systems. Once the calculations are completed PSNS&IMF will seek approval from fleet customers. This change will be implemented if the approval is granted.

The second initiative is the replacement of low flow once through non-contact cooling water with chillers. PSNS&IMF engineers are studying the feasibility of using small chillers for heat exchangers with non-contact cooling water flows of 150 gpm or less. PSNS&IMF believes these initiatives are reasonable in the context of AKART but must be approved by the cognizant US Navy technical authorities.

12.7.5 Treatment Technologies for Copper in Water from Dry Docks

As described in Section 12.4 the combined hydrostatic relief groundwater and vessel cooling water contains an estimated average copper concentration of less than 12 μg/l, with a maximum concentration of 33 μg/l. Under the proposed Working Draft NPDES Permit PSNS&IMF would have to treat the dry dock outfall discharges to remove copper to less than 2.4 μg/l. Currently, there are no treatment technologies available to remove copper from this volume to less than 2.4 μg/l.

The most up-to-date comprehensive study of metal removal wastewater treatment systems is the evaluation that the EPA did to develop the Metal Products and Machinery (MP&M) Effluent Limitations Guidelines (EPA 2003). The proposed MP&M regulation covered facilities that perform manufacturing, rebuilding, and maintenance activities while processing metal parts, machinery, or metal products. It covered 15 industrial sectors including aerospace, aircraft, automobile, and shipyards. The pollutants of concern at these facilities usually contain copper. In fact, 263 of the 266 existing MP&M General Metals subcategory (facilities that generate wastewaters containing various metals) direct dischargers are already covered by 40 CFR 433, Metal Finishing Effluent Guidelines, which has the monthly average direct discharge limit for copper of 2.07 mg/l (per the Federal Register of May 13, 2003, page 25700, MP&M Final Rule Promulgation).

The EPA evaluated the performance of industrial wastewater treatment systems utilized at these facilities to determine MP&M effluent limitations. In 2001 the EPA proposed the Best Available Technology Economically Achievable (BAT) limitations for existing direct dischargers in the General Metals subcategory. The proposed BAT limit for copper was 280 μg/l, which was based on the treatment technologies of metal precipitation with sodium hydroxide or lime followed by a clarifier and filter press for solids removal and dewatering. In 2003, for the final MP&M rule promulgation, the EPA did not promulgate any new metal limits, including the limit of 280 μg/l for copper. The reason was that the costs of the wastewater treatment systems are disproportionate to the additional pollutant reductions above and beyond 40 CFR 433 limitations. Basically, the EPA has determined that for existing direct dischargers in the General Metals subcategory, the treatment option described above, that could achieve a limit for copper of 280 μg/l, is not the BAT. Even though this limit was never promulgated, the EPA has established that the best available treatment technology for wastewater containing metals can only reduce copper to less than 280 μg/l. That is more than 100 times higher than the proposed copper limit of 2.4 μg/l.

The EPA proposed a copper limit of 160 μg/l under New Source Performance Standards (NSPS) for General Metals subcategory new direct dischargers. NSPS limits are generally more stringent than BAT limits. This is because new dischargers can more efficiently incorporate the latest treatment technologies. This NSPS discharge limit of 160 μg/l was based on the treatment technologies of metal precipitation with sodium hydroxide or lime followed by microfiltration (instead of a clarifier) for solids removal. In the MP&M Final Rule Promulgation of May 13, 2003, based on comments on the proposed rule, the EPA acknowledged that its microfiltration database is insufficient to support a determination that the copper limit of 160 μg/l is technically achievable (page 25702 of the Federal Register of May 13, 2003).

In summary, in the process of MP&M Effluent Guidelines development, the EPA determined that for metal removal treatment systems, the best available technology can remove copper to less than 280 μg/l. The copper discharge limit of 160 μg/l was proposed for new discharges based on microfiltration technology, but finally removed due to inadequate treatment data.

12.7.5.1 Treatment by the Oily Water Treatment Systems

PSNS&IMF currently has three Oily Water Treatment Systems (OWTS) for the treatment of Navy vessel bilge water and miscellaneous oily wastewaters generated in the Shipyard. The three OWTS has

combined capacity of 200 gpm and discharges to the sanitary sewer after treatment. The OWTS utilizes the same technologies that are described as BAT in the MP&M effluent category, which includes oil/water separation, metal precipitation with sodium hydroxide or lime, and clarifier for solids removal. On average, the OWTSs at PSNS&IMF have been able to reduce copper in the effluent to about 77 µg/l. The 95th percentile of treated effluent level is 169 µg/l.

PSNS&IMF has recently purchased a new 200 gpm OWTS at a cost of about $3 million, which include capital costs for the treatment skid, two 20,000-gallon influent wastewater holding tanks, and foundation preparation. The cost for foundation preparation in some areas of the shipyard could increase the overall cost to $7.6 million per unit based on complications due to excavation in the Shipyard environment with crane/rail tracks and underground utilities. At the maximum dry dock outfall discharge flow of 20 MGD PSNS&IMF would need to have sixty-nine (69) 200-gpm OWTS at the estimated cost of $207 million and annual operating in excess of 70 million dollars per year (based on a cost of treatment of 1 cent per gallon). Given the high cost and minimal if any expected pollutant removal efficiency, this option is not economically reasonable.

12.7.5.2 High Rate Clarification (Actiflo)

High Rate Clarification (HRC) is a treatment technology for wet weather flows. Many older cities use the same sewer piping system for both storm and sanitary sewer flow. During heavy rain periods the volume of stormwater entering the sewer system, due to inflow and infiltration will overwhelm the treatment capability of the Publicly Owned Treatment Works, i.e., the sewage treatment plant. The combined storm and sanitary sewer wastewater is typically diverted to a surface water body without treatment. HRC is designed to treat this high volume wet weather flow, which is mostly stormwater. As the name implies HRC provides rapid settling to achieve highly clarified effluent for a high flow situation.

The City of Bremerton uses the Actiflo HRC treatment technology at their East Plant Combined Sewer Overflow treatment plant. The Actiflo HRC process uses microsand to provide rapid settling of suspended solids. In this process the stormwater is first subjected to a coagulant such as an iron or aluminum salt. The coagulant destabilizes the suspended particles enabling them to come together and form microflocs. With the introduction of the microsand and the polymer, the microflocs attach to the sand, with specific gravity of 2.65, and settle at a high rate. This capability for high settling rates, enable the treatment plant to have a small footprint and handle a high volume of wastewater. The Actiflo HRC can provide footprints 5 to 20 times smaller than conventional clarification process (http://www.krugerusa.com/en/files/5113.htm). The microsand sludge is sent to a hydrocyclone where the sludge is separated, and the microsand is recycled back into the process.

The City of Bremerton's Actiflo HRC East Plant can process a peak flow of 20 MGD with the design flow of 8 to 10 MGD. The design, capital, and installation cost was $3.6 million (2001). The Actiflo HRC treatment system is capable of handling suspended particulates associated with the high flow rates of wet weather stormwater. While this treatment system is very suitable for removal of suspended solids in stormwater, it is not useful for dry dock vessel cooling water and hydrostatic relief groundwater because the copper in cooling water is mostly in the dissolved form. Based on the PSNS&IMF dry dock outfall discharge copper results, as the copper concentration gets closer to 10 µg/l the higher is the ratio between dissolved copper and total copper. The current Actiflo HRC treatment technology would not remove copper in dissolved form, unless precipitation chemicals are added to the process. This treatment technology, as is, is not suitable for reducing copper concentrations in cooling water and hydrostatic relief groundwater.

12.7.5.3 Electro-Coagulation

The Wave Ionics Electrocoagulation treatment system uses electrical current to coagulate particles and then remove them via sedimentation/clarification. There is an electrocoagulation treatment system made

by Water Tectonics, Inc. at Nichols Brothers Boat Builders in Freeland, WA. This treatment system is designed for the removal of metals in stormwater, which are attached to the suspended particulates. Vessel cooling water and hydrostatic relief groundwater are different in that their low copper level is mostly in dissolved form.

In the Boatyard Stormwater Treatment Technology Study prepared by Taylor Associate, Inc., (Taylor 2008) the Wave Ionics Electrocoagulation treatment system was evaluated for the treatment of stormwater from a boatyard. None of the effluent composite or grab samples from the Electrocoagulation treatment system met the copper discharge criteria of 10 µg/l (page 21 of the report). The median of the effluent composite samples was 92.5 µg/l. The median of the effluent grab sample was 752 µg/l.

According to Water Tectonics in the Study the high effluent copper results were due to inadequate flow rate through the treatment system. The Electrocoagulation treatment system was designed to operate at 50 gpm. Due to constraints at the boatyard and low precipitation runoff volume, the unit was operated at an inflow rate of 16 gpm. This lower inflow rate created a low flow environment in the treatment cells, which can promote cell loading (blinding) and a less than favorable treatment environment.

In summary, there is not enough data to consider the Electrocoagulation treatment system as an AKART treatment technology. In addition, this treatment system is designed for stormwater, not vessel cooling water or hydrostatic relief groundwater.

12.7.5.4 Sanitary Sewer

Since the proposed Working Draft NPDES Permit water quality-based copper limit for PSNS&IMF dry dock outfall discharges is 2.4 µg/l and the copper concentration of the cooling water and groundwater combined may be above 2.4 µg/l, one option to avoid exceedance is to divert this water to the sanitary sewer. However, at the average flow of 9.3 MGD and maximum flow of about 20 MGD, pumping this much water into the sanitary sewer will overwhelm the City of Bremerton's POTW, which only has a maximum design capacity of 10.1 MGD. The PSNS&IMF current sewage contract with the City only allows a maximum flow of 3 MGD. This option would require the City of Bremerton to triple the size of its POTW and both PSNS&IMF and the City would have to upgrade sewer piping and lift stations capacity significantly to handle this flow. Given the time constraints imposed, PSNS&IMF was not able to develop a cost estimate for tripling the size of the City of Bremerton's POTW and the attendant required upgrades in pipe and lift station capacities. PSNS&IMF does feel confidant that the time required to publicly fund, design, permit, and build a new, much larger POTW would far exceed the 5 year term of an NPDES permit. Based on this alone, this is not a viable option.

12.7.6 AKART Analysis Summary

Table 12-6 summarizes the AKART analysis conducted for hydrostatic relief groundwater. Since the existing PSNS&IMF management practice already achieves AKART (is within the AKART range) the primary implementation criteria is economic reasonableness. Table 12-7 is the same summary except for non-contact cooling water.

Table 12-6: Dry Dock Hydrostatic Relief Groundwater

Treatment Option and/or Management Control Method	Viability/Effectiveness	Compliance with Working Draft Permit Water Quality-Based Discharge Limit?	Cost	Impact to Operation	Potential for Implementation Based on Economic Reasonableness
Treatment by OWTS	The average concentration of copper in dry dock hydrostatic relief ground water is about 2 - 3 µg/l. The OWTS typically removes copper to below 50 µg/l. The OWTS is not a effective treatment method for hydrostatic relief groundwater	No	$72 million (2008 dollars). Require 24 200-gpm OWTS at $3 million per unit.	Each OWTS will be around 65 ft. by 80 ft. There isn't enough space around the piers and dry docks to locate these OWTSs. Installation construction will significantly disrupt production work.	Low
Treatment by HRC-Actiflo	HRC-Actiflo is designed for urban wet weather stormwater, which contains copper in particulate form. Copper in hydrostatic relief groundwater is mostly in dissolved form. The HRC-Actiflo will not be effective as a treatment method for hydrostatic relief groundwater.	No	$3.6 million (2001 dollars) for treatment system alone.	Space is limited to locate pump and piping to get the groundwater to the HRC-Actiflo treatment plant. Installation construction will disrupt production work.	Low
Diversion to Sanitary Sewer	At 7 MGD the volume of hydrostatic relief groundwater will be too much for PSNS&IMF's sanitary sewer system. PSNS&IMF would need to upgrade pump stations and sewer piping to accommodate this flow. In addition, PSNS&IMF is only contracted to pump a maximum of 3 MGD to the City of Bremerton's Wastewater Treatment Plant. The City's Treatment Plant maximum daily capacity is 10.1 MGD. The volume from the hydrostatic relief groundwater and the normal average domestic wastewater from the City of Bremerton will overwhelm the City's Wastewater Treatment Plant. The City's treatment would remove little of the copper from the groundwater since it is in the dissolved form.	Yes, by elimination of the discharge.	$32 million annually for the sewer usage charge based on the current fee schedule.	Construction to install pumps and piping to get the groundwater to the sanitary sewer and construction to upgrade sewer piping and pump station capability will disrupt production.	Low

Table 12-7: Dry Dock Vessel Non-Contact Cooling Water

Treatment Option and/or Management Control Method	Viability/Effectiveness	Compliance with Working Draft Permit Water Quality-Based Discharge Limit	Cost	Impact to Operation	Potential for Implementation Based on Economic Reasonableness
Treatment by Cooling Tower	This method is not practical. Saltwater cooling water in cooling towers will evaporate and leave salt deposit behind and quickly turn the cooling tower packings into a block of salt and render the cooling tower ineffective. In addition, cooling towers outlet best temperature is 21° C for the Seattle area in the summer. This is 5.1° C higher than the Working Draft Permit water quality-based discharge limit.	No	The estimated cost of this option was not calculated since this idea is impractical.	Cooling towers will take up critical space around the piers and dry docks. Installation construction will disrupt production work.	Low
Treatment by Chillers	Chillers can be used to reduce the temperature of cooling water to less than 16° C. Except for Dry Dock 3, dry docks 1 through 5 will each need two 400-ton chillers located on the dry dock floor. Dry Dock 6 will need one 4,600-ton chiller located topside of the dry dock and pumps on the dry dock floor to get the water up to the chiller. Space taken up by this equipment will affect production. Space may not be available due to critical dry dock crane operations.	Yes	Capital cost is $9.5 million. Monthly operation cost is $1.1 million (2008 dollars).	Space is limited for these chillers and pumps. Installation and construction will disrupt production work.	Low
Cooling Water Reduction Initiatives (including reducing cooling water flow, designing cooling water to start only when needed, replacing cooling water for small heat exchangers with chillers)	These options may be viable but will require approval from the cognizant US Navy technical authorities.	Maybe	Medium	Limited impact to production.	Unknown

13 Non-Dry Dock Stormwater Focus Areas AKART Analysis

Section 6.0 identified potential non-dry dock stormwater focus areas, which are herein analyzed. The focus areas are reiterated in Table 13-1.

Table 13-1: Non Dry Dock Focus Areas

Industrial Practice	Potential Pollutants	Associated Facilities (see Figure 1)
Crane and Railroad (SW1)	POLs	Primarily on the east side of building 450 (north of Dry Dock 6).
Metal Cutting/Recycle (SW2)	Metals	(1) Northeast of Dry Dock 3. (2) Building 368 Northeast of Dry Dock 6. (2) RMTS (Northeast of Dry Dock 6).
Metal Components (SW3)	Metals	Steelyard (eastern end of PSNS&IMF).
Vehicle and Equipment		
Outdoor Parking and Storage (SW4)	POLs	Multiple locations.
Washing and Cleaning (SW5)	POLs, Surfactants	W. side of building 455 (north of Dry Dock 6).
Awaiting Maintenance (SW6)	POLs	South of Building 455.
Outdoor Metal-Work and Cutting (SW7)	Metals and Organics	Various non-fixed locations.
Loading and Unloading Operations (SW9)	POLs	Many locations.
Storm Sewer and Stormwater Treatment Device Maintenance (SW11)	POLs, Metals, Organics	NA. Treatment devices are shown on Figure 1.
POLs – Petroleum, Oils, and Lubricants		

13.1 AKART Screening

This AKART screening answers the question: Do the focus areas fall below, within, or above the AKART range? Table 13-2 answers this question for the non-dry dock stormwater focus areas. Under the "AKART" column an answer of:

- "No" means that the focus area falls below the AKART range.
- "Yes (w/i)" means the focus area falls within the AKART range.
- "Yes (above)" means the focus area falls above the AKART range.

Also see Section 4.0 and Figure 2.

Table 13-2: Stormwater Focus Area AKART Screening

Applicable Facilities	AKART Analysis	AKART?
Crane and Railroad (SW1)	Day-to-day usage of cranes and railroad cars has little environmental impact in the context of the heavily industrial PSNS&IMF surroundings. From an AKART perspective, crane and railroad car maintenance is the focus. Primary crane maintenance is conducted on the east side of Building 450 (north of Dry Dock 6) in a 0.7 acre concrete paved area with an oil/water separator. Some crane maintenance is conducted on the east side of building 455. There is an oil/water separator associated with this area that discharges into the storm sewer. Wastewater from crane washing is collected and disposed of in the sanitary sewer. Railroad cars/engines are maintained at the east end of building 455. There is an oil/water separator associated with this area that discharges into the sanitary sewer. Railroad maintenance falls within the AKART range. Crane maintenance, specifically conducted at the 0.7 acre concrete paved area, falls below the AKART range. There are other BMPs available that could further minimize stormwater pollution.	No (crane maintenance only)
Dry Dock 3 Enclosed Recycle Facility (SW2)	The scale of vessel recycle operations conducted at PSNS&IMF is unmatched in the United States and as such, comparison with "similar" facilities in not possible. Overall, the process of cutting in an enclosed facility and actively filtering airborne emission is a high level of environmental control and is within or above the AKART range. There is no other process that could reasonably provide an increased level of treatment.	Yes (above)
Dry Dock 3 Outdoor Cutting Pad (SW2)	This outdoor cutting pad is generally used for hull sections that are too large to place in an enclosed cutting facility (either the adjacent one or facility 368). Stormwater that collects on the pad is collected via portable vacuum (shop vac) and taken to an OWTS. Again the process of vessel recycling is unique enough to PSNS&IMF that the similar facility evaluation is not applicable. Could additional controls be implemented? Yes. Overall using a shop vac to collect stormwater falls below the AKART range. Effective control takes a high degree of management to prevent overflows. A higher level of control is required so the practice falls within the AKART range.	No
Building 368 Enclosed Recycle Facility (SW2)	This facility is substantially similar to the Dry Dock 3 enclosed facility and also reasonably falls within or above the AKART range.	Yes (above)

Table 13-2: Stormwater Focus Area AKART Screening

Applicable Facilities	AKART Analysis	AKART?
Recycle Materials Transfer Site (RMTS) (SW2)	The RMTS is a collection point for scrap metals from the PSNS&IMF recycle program. As currently configured, a portion of stormwater runoff from the RMTS is directed to an advanced stormwater treatment system consisting of a CDS™ and StormFilter™. The rest goes into standard catch basins. Standard housekeeping BMPs are in use at the site to minimize pollution from areas that do not flow to the CDS™/StormFilter™. Based on the Similar Facility Evaluation, Section 10.0, media filtration is in use or was tested at Cascadé Portland Shipyard, NASSCO, and Todd Shipyards. The Evaluation also indicates that advanced stormwater treatment BMPs are effective at reducing toxicity and metals levels but that effluent quality can be quite variable. Widespread acceptance and long term use of advanced BMPs is somewhat limited for large facilities but it has achieved a demonstrated level of effectiveness and is reasonable for the RMTS. The CDS™/StormFilter™ falls within the AKART range. Good housekeeping as the primary BMP for that portion of the site that does not flow into the CDS™/StormFilter™ is below the AKART range. Pollutants of concern will not be adequately removed and a higher degree of management is available and reasonable. The RMTS falls below the AKART range as a portion of the site is inadequately treated.	No
Dry Dock 3 Metal Sorting Area (SW2)	The primary BMPs for this triangular area, located north of the cutting facility, are good housekeeping and catch basin insert filters. These BMPs are below the AKART range since (1) pollutants of concerns will not be adequately controlled, and (2) there are known and reasonable alternative pollution control methods that would be more effective.	No
Steelyard (SW3)	The steelyard located at the eastern extent of PSNS&IMF is a paved laydown area for metal components and raw materials such as pipe, plate steel, and aluminum. Current BMPs are good housekeeping and a Vortechs™ treatment unit. Primarily steel and aluminum materials are stored in the steelyard, neither of which are pollutants of concern. No Industrial practices other than loading/unloading metal occur in the steelyard. This facility achieves AKART since: (1) pollutants of concern are not discharged, (2) no ancillary operations are conducted that might introduce pollutants of concern, (3) good housekeeping practices are effective since the facility is paved, and (4) the level of activity at the facility is low.	Yes (w/i)

Table 13-2: Stormwater Focus Area AKART Screening

Applicable Facilities	AKART Analysis	AKART?
Outdoor Parking and Storage (SW4)	There is little parking of private vehicles on PSNS&IMF. They are either parked off-site or in the NBK Bremerton portion of the facility. Additionally, PSNS&IMF cooperates with Kitsap County Transit in the Worker/Driver Program. The program operates 26 buses driven by PSNS&IMF/NBK Bremerton employees. The program lessens the demand for private vehicle parking. Kitsap Transit maintains the worker/driver busses (http://www.kitsaptransit.org/WorkerDriverBusProgram.html). The similar facility evaluation did not reveal any specific concern regarding parking of private vehicles. For new facilities, the Navy follows the Stormwater Management Manual for Western Washington (Ecology 2005). PSNS&IMF BMP 5, Drip Pans, applies to private vehicles. Parking of private vehicles falls within the AKART range. BMPs associated with outdoor parking and storage are addressed in Section 15.	Yes (w/i)
Washing and Cleaning (SW5)	Vehicle washing is conducted at the west side of Building 455. There are two adjacent washing areas: a mechanical washing area and a hand washing area. The mechanical system recycles wash water until it is no longer acceptable and then it is processed through an oil/water separator prior to discharge into the sanitary sewer. Wastewater from the hand-wash system is processed through an oil/water separator prior to discharge into the sanitary sewer. Equipment can be cleaned via steam cleaning on the east side of building 455. Effluent is processed through an oil/water separator prior to discharge into the sanitary sewer. All discharges are included in the PSNS&IMF SWDP. PSNS&IMF implements BMP 6, Vehicle and Equipment Cleaning which states in part "only wash vehicles and equipment in designated approved cleaning areas with liquid wastewater routed to the sanitary sewer." The combination of the SWDP coverage for these discharges, recycling of wastewater from the mechanical wash, and direction via BMP 6 makes washing and cleaning fall within the AKART range.	Yes (w/i)
Vehicle and Equipment Awaiting Maintenance – Building 455 (SW6)	Vehicles and equipment awaiting maintenance are staged adjacent to Building 455, located north of Dry Dock 6. Current management practices include BMPs such as drip pans, inspections, catch basin inserts, and storing leaking vehicles inside Building 455 whenever possible. Current management practices fall below the AKART range as there are other BMPs available that could further minimize stormwater pollution.	No

Table 13-2: Stormwater Focus Area AKART Screening

Applicable Facilities	AKART Analysis	AKART?
Outdoor Metal Work (SW7)	Non-dry dock outdoor metal grinding, welding, cutting, and/or sanding occurs intermittently as needed to support a specific project. Locations vary. BMP 13, Outdoor Work Operations requires: When performing outdoor work operations, have equipment and supplies on -hand to control and cleanup debris. Many outdoor work operations can produce debris which if not controlled can wash into Sinclair Inlet. Some common outdoor work operations of concern are sanding, cutting, grinding, painting, material transfer, and mixing; use of oils, solvents, detergents, and degreasers. Consider the potential risks of your work and prepare accordingly. Items you may need include a spill kit, drop cloths, absorbents, rubber mats, storm drain filters, tape, tarps, brooms, or vacuums. Section 15 addresses Outdoor Metal Work.	NA – See Section 15.0
Loading and Unloading (SW8)	This category generally addresses loading and unloading conducted at PSNS&IMF at non-dry dock locations, typically at loading docks. Loading and unloading is addressed in detail in the SWPPP. The following PSNS&IMF BMPs address loading and unloading: BMP 3, Materials Storage and Handling BMP 8, Material Loading and Unloading Section 15 addresses conventional BMPs including Loading and Unloading.	NA – See Section 15.0
Storm Sewer Maintenance (SW9)	Section 15 addresses conventional BMPs including Storm Sewer Maintenance.	NA – See Section 15.0

13.2 Follow-on AKART Analysis

Based on Table 13-2, the focus areas labeled 'No' may fall below the AKART range. This section further evaluates those focus areas.

13.2.1 Crane Maintenance Pad

Crane maintenance is primarily conducted on the east side of building 450 (north of Dry Dock 6) on this concrete pad with spill-control oil/water separator. The selected AKART option is to install additional follow-on advanced stormwater treatment meeting the requirements of Washington State's Stormwater Management Manual. (Ecology 2005)

13.2.2 Dry Dock 3 Outdoor Cutting Pad

This cutting pad located northeast of Dry Dock 3 could reasonably be improved to better manage runoff. Although PSNS&IMF initially considered a number of AKART options, ultimately, covering the area to prevent contact between stormwater and cutting debris generated at this site is the selected option. The design is now underway and scheduled for completion in December 2008. Installation/construction is scheduled for the first quarter of 2009. Estimated cost is $20,000.

13.2.3 Recycle Materials Transfer Site (RMTS)

This area contains an existing CDS/StormFilter unit capable of treating stormwater from this area, however, the original design failed to include proper grading of the paved areas so that stormwater flow would be appropriately directed to the treatment unit. PSNS&IMF was aware of the shortcomings of this facility prior to development of the AKART Study, and a design for correcting the flow issues is complete. Construction completion is scheduled prior to the **end of 200X**. Construction will include installing four new catch basins and about 267 linear feet of piping to direct site stormwater into the existing CDS™/StormFilter™ unit. When construction is complete the RMTS will fall within the AKART range. Additional evaluation is unnecessary because adequate treatment already exists at the site.

13.2.4 Dry Dock 3 Metal Sorting Area

This sorting area located northeast of Dry Dock 3 could reasonably be improved for better management of runoff. Table 13-3 outlines the options that were considered to bring the facility up to the AKART standard.

Table 13-3: Dry Dock 3 Metal Sorting Area AKART Options

Option	Description	Effectiveness	Maintenance	Cost
A – Cover/Roof the Area	Put roof or other cover over area.	Medium	Low	Medium
B – Install Sump	Remove stormwater and discharge into the sanitary sewer.	High	Medium	Medium
C – Sanitary Sewer	Pump sump to sanitary sewer.	High	Low	High

PSNS&IMF selected Option B, Install Sump, as the most viable AKART option. The selected AKART option is to install an oil/water separator and route the discharge into the sanitary sewer directly or via the Dry Dock 3 PWCS. Option C would require approximately 60 feet of trenching to connect to the sanitary sewer, a costly effort. Option A, Cover/Roof the Area, was not deemed practical due to the irregular shape of the area.

13.2.5 Vehicle and Equipment Maintenance – Building 455

This 0.6 acre area located south of Building 455, where vehicles and equipment are parked when awaiting maintenance, could reasonably be improved for better management of runoff. The three options for enhancing the quality of stormwater runoff from this site are covering/roofing the area, discharge to sanitary sewer, and additional stormwater treatment.

- Covering/roofing the area is feasible and would have the highest level of environmental protection. From a design standpoint, the covering/roof would need to provide adequate clearance to accommodate mobile cranes, aerial work platforms, and existing traffic. This option would require an approximate 30,000 square feet open-type structure that vehicles and equipment awaiting maintenance would be parked.
- Discharge into the sanitary sewer is feasible. Some level of pretreatment, like an oil/water separator, would be required and the discharge would need to be added to PSNS&IMF SWDP ST-7374.
- Additional stormwater treatment is a feasible option and is further evaluated below. The Stormwater Management Manual for Western Washington (Ecology 2005) specifies, if

discharge is to surface water, oil/water separation followed by a "basic treatment" BMP. The Manual lists four potential options for oil control:

- American Petroleum Institute (API) – Type Oil/Water Separator
- Coalescing Plate (CP) Oil/Water Separator
- Catch Basin Inserts (CBIs)
- Linear Sand Filters

Both types of oil/water separators fall within the AKART range and could reasonably be used for this area. Their history of usage is well established and with proper design, installation, and maintenance would achieve stormwater Oil & Grease benchmark values per Table 9-2. Both separator types will retain some TSS entrained in the stormwater. API separators are simple to operate and maintain. CP separators require an additional maintenance burden but have the benefit of a smaller footprint and potentially greater efficiency. The site could be retrofitted to install a single separator. Existing catch basins and piping would remain in use. There are existing separators on base so the additive burden (in terms of labor and training) would be minimal.

CBIs are considered emerging technologies by Ecology (Ecology 2005) and are distinguished from non-woven fabric inserts, which are in use by PSNS&IMF. CBIs are "a structure (screened box, brackets, etc.) which contains a pollutant removal medium." The above reference notes that CBIs are not recommended as a substitute for basic BMPs. For this reason and since they are emerging technologies, CBIs are not a viable option for treating runoff from this area in the context of AKART.

In addition to linear sand filters, sand filter vaults might be applicable for this area. Sand filters retain TSS in addition to Oil & Grease. Sand filters are capable of achieving stormwater oil & grease benchmark values per Table 9-2. Potential design constraints of sand filter vaults are they require about 4 feet of hydraulic head to operate and they can readily clog if solids levels and/or petroleum levels are high. A linear sand filter(s) does not have the hydraulic head constraint but is susceptible to clogging. Maintenance on any type of sand filter, while not complex, would be new to maintenance staff and require orientation. From a design and constructability standpoint it would be relatively easy to reroute Building 455 roof drains to bypass the linear sand filters. Linear sand filters would replace existing catch basins allowing the use of existing piping to some degree. Railroad tracks divide the site and make installation of a single linear sand filter unworkable. With significant re-grading of the area, three to four filters could accommodate the site. These constraints likely make linear sand filters or a sand filter vault unsuitable due to the physical attributes of the site.

Overall, from a qualitative standpoint, if this option is selected, a CP oil/water separator is most likely the best option, but design engineers should evaluate both sand filters and separators. The final decision should be based on cost, maintainability, and disruption of use of the area.

Table 13-4 itemizes the AKART options for the Building 455 vehicles/equipment-awaiting-maintenance area.

Table 13-4: Building 455 AKART Options

Option	Description	Effectiveness	Maintenance	Capital Cost
A –New Separator and Pad	Install new separator, pour new concrete pad, new catch basins, and install new piping. Option could include a sand filter(s) instead of a separator.	Medium	Medium	$950,000 (2008)
B – Reroute to Sanitary Sewer	Reroute existing storm sewer to discharge into sanitary sewer following oil/water separation.	High	Medium	$575,000 (2008)
C – Cover/Roof	Construct open roof structure with electrical, compressed air, and water.	High	Low	$850,000 (2008)
D – Cover/Roof with Pad	This is basically a combination of Options A, C, and D	High	Low	$2.2M (2008)
Option B would require prior Ecology approval via the PSNS&IMF SWDP.				

Weighing the options above PSNS&IMF has chosen Option B, reroute to the sanitary sewer. The overall effectiveness is good compared to the cost and complexity of the other options.

14 General Non-Dry Dock Stormwater AKART Analysis

14.1 Description of the PSNS&IMF Stormwater System

The BNC stormwater system consists of approximately 136,000 feet (26 miles) of collection lines with pipe diameters ranging from four inches to 54 inches. There are 1,807 grated (non-rail) drain inlets and 2,389 grated (rail) drain inlets; the system also includes 15 oil/water separators, and 156 outfalls into Sinclair Inlet.

The BNC stormwater system has three functions: 1) to provide a drainage path for stormwater runoff from buildings via the roof drains, catchments, and catch basins surrounding the buildings and structures within the BNC, 2) to provide drainage for non-rail areas which include drainage for streets and parking lots as well as drainage from the pier decks, and 3) to provide drainage for the track rail system which includes both crane and train rails. Crane rails only exist inside the industrial area. Locomotive (i.e. train) rails are installed in both NBK and the PSNS&IMF industrial area.

The general direction of stormwater flow is from north to south into Sinclair Inlet. The rain that falls on the BNC flows into the stormwater system catch basins and is transported by underground pipes via gravity to the stormwater outfalls located in the industrial area.

In addition to the 156 outfalls, there are approximately 1,043 catch basins or track drains on piers that drain directly to the Sinclair Inlet without piping from the catch basin to the outfall. Many of the other outfalls serve small drainage areas. There are no outfall diffusers. Many of the non-land areas, piers, docks, moorings, etc. are not considered individual sub-drainage systems because the drainage falls directly into the inlet without any substantial piping between the inlet grate and the outfall.

In addition to the grated stormwater inlets described above, the rail system utilizes approximately 2,389 grated inlets and track drains draining the rail system within the BNC. The majority of these drains are not connected to stormwater piping but instead infiltrate through the subsurface and eventually into Sinclair Inlet without any piping between the inlet grates and the outfalls. For the most part track drains are only marginally operative in draining stormwater adjacent to the tracks due to clogging.

The stormwater system is an old system, which was once combined with sanitary system piping to form the wastewater/stormwater system. Construction began on the BNC in 1898, and a primitive wastewater/stormwater systems was installed. In 1919, the first drawing was prepared that indicated the existence of an independent stormwater system. Over time, new facility construction and evolving mission requirements increased the demand on the stormwater system and the two systems were separated. The BNC experienced a facility construction boom from 1934 through 1948 to support American World War II ship construction efforts. At that time, the majority of the new facilities were constructed with stormwater piping included. Facilities constructed since World War II have included stormwater piping in the structure design.

Throughout the BNC the stormwater system is composed primarily of clay pipe with concrete, PVC, steel, and cement-asbestos pipe generally making up the balance of the piping. The depth of the stormwater system ranges from 1 foot to 20 feet below ground surface. Within the industrial area, stormwater is collected from building roofs by rain gutters and roof drains. The roof drains discharge into storm drain piping or into catch basins located around the buildings. The ground surfaces around the buildings are impervious surfaces made of asphalt, concrete, or a concrete

base with asphalt over it. Within the industrial area there are no unpaved areas therefore infiltration of stormwater into site soil is minimal. On the piers and other surfaces located directly over the water there are drain holes in the deck which deposit the rainwater directly into Sinclair Inlet.

Many stormwater outfalls discharge to Sinclair Inlet below mean lower low tide. The majority of the industrial areas of the BNC are only a few feet above high tide, which means that the majority of the stormwater piping is tidally influenced. This increases the complexity of taking stormwater samples and makes it difficult to use passive stormwater treatment systems. This is especially true for the drainage areas closest to the waterfront, which are also the most industrialized areas.

14.2 Current Management Practices

BMP are used to prevent or minimize the generation of pollutants, their release, or their potential release into the environment. Structural stormwater BMPs that are currently in use for the BNC are listed below. Conventional BMPs, such as Good Housekeeping, are addressed in Section 15.0 and included as Attachments 3 and 7.

- Stormwater Treatment Devices. There are a number of oil/water separators connected to the storm sewer for minimizing release of non-point source petroleum and other pollutants. Most of the separators are of standard design. There are two locations that incorporate advanced stormwater treatment units. The Recycle Material Transfer Site (RMTS) incorporates a Continuous Deflective Separation (CDS™) pretreatment device and follow-on media filtration with a Stormwater Management Incorporated's[16] Stormfilter™. The main component of the Stormfilter™ is cartridge media filters that are placed in a below-grade vault downstream of the CDS™ unit. The CDS™ unit removes solids from stormwater by inducing a swirling action. A Vortechs™ stormwater treatment device is located in the steelyard at the eastern boundary of PSNS&IMF. The unit is designed to remove sediment and oil from stormwater by promoting a swirling motion, which concentrates and entrains pollutants. Figure 1 shows the location of existing stormwater treatment devices.
- Catch Basin Sumps. Most storm sewer catch basins have sumps for retaining heavier materials that are entrained in stormwater.
- Catch Basin Filters/Inserts. PSNS&IMF uses non-woven fabric catch basin inserts at strategically located in catch basins to help minimize pollutants. Foss and StreamGuard™ makes inserts typical of those used by PSNS&IMF.

14.3 History of Stormwater Mapping and Investigations

In 1992, a project was executed to prepare an updated map of the BNC storm drainage system. Phase I of this project also identified deficiencies such as non-complying inflows and was the first of three contracts issued to develop accurate maps of the stormwater system. The final Phase I report, Revised Final Stormwater Base Map Report Puget Sound Naval Shipyard Volume I dated December 10, 1992, developed a stormwater map from an extensive field survey that located catch basins and manholes using the Navy coordinate system and base drawings.

[16] Stormwater Management Inc., is now part of CONTECH Stormwater Solutions Inc., www.contech-cpi.com

Phase II, which was completed in 1993, provided additional field investigation and office review to resolve discrepancies between the original Public Works Drawings and the stormwater maps generated in Phase I. A recommendation of this phase was for "...a complete and reliable map of the Shipyard's Storm Drain System." Also in 1993, a separate study was completed titled Evaluation of Storm Sewer for NPDES Violations. The results of the study included a table listing the "...sources identified in the study area as constituting illicit or potential illicit connections to the storm drainage system, per the current draft Shipyard NPDES permit."

In 1994, a Phase III Stormwater Base Map Update study was completed to further define the stormwater system. In this study, Stormwater Base Map Update Phase III Volume I Final Submittal, further field investigations were completed. These investigations include dye testing to determine pipe connections, identification of combined stormwater outfalls with the City of Bremerton, and modification of the Stormwater Base Map to incorporate stormwater facilities constructed since the completion of Phase I. The result of Phase III was a "final" stormwater base map consisting of five drawings of the system.

BNC recently awarded a contract that will include cleaning the storm drainage structures (catch basins and manholes) and a video inspection of the associated piping systems within the central terrestrial portion of Operable Unit B at the BNC. The cleaning and repair is expected to start in the near future and is anticipated to extend over the next three years.

All of the catch basin locations have been identified through the completed stormwater studies. The identified catch basin inlet grates have "Do Not Discharge" stainless steel markers in the shape of a fish installed on the grate. Each marker has a unique identification number imprinted on it.

A better overall assessment of the stormwater system will be gained upon the completion of the pending contract to video the stormwater system. When completed, the amount of debris and the condition of the pipe will be known, as well as having better information regarding the location and pipe material within the stormwater system.

There are no capital improvements planned for the stormwater system.

14.4 AKART Analysis

14.4.1 Similar Facility Analysis

Section 9.0 imparts that most shipyards manage non-dry dock stormwater substantially through use of conventional BMPs implemented via a SWPPP. The two exceptions are Todd Pacific Shipyards and National Steel and Shipbuilding Corporation, both medium size facilities. These facilities collect stormwater and discharge it into the sanitary sewer. Large shipyards, as evaluated in Section 9.0, do not collect non-dry dock stormwater for discharge into the sanitary sewer or otherwise provide centralized treatment.

14.4.2 Other Potential AKART Technologies/Practices

This section takes a broader look at non-dry dock stormwater to identify and evaluate treatment technologies/methods that might be employed even though current management practices, in concert with new source control policies, bring PSNS&IMF's non-dry dock stormwater management up to the AKART standard.

14.4.3 Stormwater Copper Loading

Attachment 9 estimates that the total amount of copper from stormwater runoff from PSNS&IMF is 11.33 kilograms (25 pounds) per year. This value will be used in the AKART analysis to roughly determine the cost per kilogram to remove copper. While copper is a pollutant of concern, it is also used, in this evaluation, as a surrogate for metals and Oil & Grease.

14.4.4 AKART Options

The three options evaluated are:

- Option 1 - Full Stormwater Collection and Treatment
- Option 2 - Partial Stormwater Collection and Treatment for those highly industrialized areas
- Option 3 - High efficiency street sweeping and containment of spray painting of anti-fouling paints

While two primary options of collecting and managing stormwater are evaluated, they are within the context of a single concept. The BNC was conceptually divided into eight separate zones each subdivided into north and south. The north/south division is along Farragut Avenue. The eight zones were used to help isolate key areas in terms of estimating cost. The north/south subdivision was to distinguish industrial from non-industrial areas. Farragut North and NBK Bremerton are mainly non-industrial areas. Farragut South is mainly PSNS&IMF. See Figure 10. Table 14-1 outlines characteristics of each zone.

Table 14-1: Zone Design Characteristics

Zone #	Characteristics	
1	Area:	12 acres
	Stormwater Volumes:	3,119,603 gallons/day from land 36,250 gallons/day from Pier 6
	Outfalls:	Zone 1 has 9 active outfalls.
2	Area:	20 acres
	Stormwater Volumes:	3,119,603 gallons/day from land 36,250 gallons/day from Pier 5
	Outfalls:	Zone 2 has 11 active outfalls.
3	Area:	34 acres
	Stormwater Volumes:	4,202,607 gallons/day from land 7,469 gallons/day from Pier 8 52,500 gallons/day from Pier 7
	Outfalls:	11 active outfalls.
	Note:	Zone 3 ties into the City of Bremerton at the Ferry Terminal, also Farragut North and South Headers will connect in this zone.
4	Area:	31 acres
	Stormwater Volumes:	1,987,501 gallons/day from land 278,883 gallons/day from Pier 4
	Outfalls:	Zone 4 has 12 active outfalls.
5	Area:	40 acres
	Stormwater Volumes:	1,223,881 gallons/day from land 408,156 gallons/day from Pier 3
	Outfalls:	Zone 5 has 19 active outfalls.
	Notes:	This zone will have a 24" header that runs in the mud under the entrance to DD-5.

Table 14-1: Zone Design Characteristics

Zone #	Characteristics	
6	Area:	41 acres
	Stormwater Volumes:	3,430,872 gallons/day from land 34,831 gallons/day from Pier 9
	Outfalls:	Zone 6 has 19 active outfalls.
7	Area:	42 acres
	Stormwater Volumes:	4,258,264 gallons/day from land 160,831 gallons/day from Pier C
	Outfalls:	Zone 7 has 38 active outfalls.
	Notes:	This zone is in the military support/ homeported area and only very limited industrial work can be performed in this zone because there is no crane/rail services available at the pier.
8	Area:	38 acres
	Stormwater Volumes:	3,864,443 gallons/day from land 160,831 gallons/day from Mooring E 67,797 gallons/day from Mooring F
	Outfalls:	Zone 8 has 23 active outfalls.
	Notes:	This zone has an 8" connection to the City of Bremerton. This zone contains 54" and 48" main headers to Sinclair inlet. There are no drains on the Moorings they are impervious surfaces. There is no crane rail service in this zone.

The primary design parameter is the 10-year, 24-hour storm, which for Bremerton is 3.75 inches of rainfall. For the 258 acre area[17], this equates to roughly 26,165,175 gallons of stormwater.

The stormwater collection and treatment options include the following components:

- Farragut North
- Farragut South
- Pier Areas
- Crane/Rail Tracks
- Treatment Unit that supports the zone
- Tanks to support the zone

Options 1 and 2 are to collect stormwater and direct it to new treatment units. The treatment units would be capable of removing Oil & Grease, metals, and suspended solids. In this conceptual design, high rate clarification (HRC) (see Section 12.0 for a description of HRC) was used as the treatment option. Discharge of stormwater into the sanitary sewer was initially considered as an option but rejected because the volume of stormwater would overwhelm the City of Bremerton's POTW. Similar to cooling water and hydrostatic relief groundwater (Section 12.0) discharge of stormwater into to the sanitary sewer is not a viable option due to the volume of stormwater generated. While HRC was "used" in these options, it is a stand-in for one of a number of treatment options that may be able to reduce pollutant levels in this volume of stormwater. At this conceptual level, the exact type of treatment considered is not critical. There is no known

[17] The industrial area as defined in Section 1.0 does not include piers/wharfs. The surface areas of the piers, are, however, included in this figure.

available treatment option that would achieve the Working Draft Permit limit of 5.8 µg/l for the volume of stormwater PSNS&IMF generates.

The third option is a combination of enhanced source control and enhanced street/surface cleaning. The three options are discussed below:

14.4.4.1 Option 1 – Full Stormwater Collection and Treatment.

This option is to collect and treat PSNS&IMF non-dry dock stormwater up to the design storm volume. Stormwater from NBK Bremerton, the non-industrial component of BNC, will be directed/diverted into Sinclair Inlet without additional treatment. Since NBK is a non-industrial area, stormwater will continue to be "treated" using an approach similar to that of a small municipal stormwater system. One HRC unit would be used to treat stormwater for each of the eight zones. The crane rail system would be modified to ensure that component of stormwater would be diverted to the HRC. Treated effluent would be discharged into Sinclair Inlet.

An order-of-magnitude cost estimate was conducted for each of the eight (8) zones. The estimates includes excavation, new piping, paving, catch basins, treatment systems (one for each zone), crane track drainage, crane track removal, replacement, and testing, storage tanks, sumps, pumps, relocation of utilities, and mechanical and electrical hookups. The order-of-magnitude cost for all eight zones is approximately 13.5 billion dollars (2009). Table 14-2 provides a cost breakdown. Attachment 10 contains the cost estimate for this option.

The majority of the Option 1 costs are associated with capture and treatment of water from track drains, (7.6 billion dollars), and pier drains, (4.2 billion dollars). Together these two areas account for over 87% of the overall cost but only constitute only about 10% of the total area drained. Another significant cost factor is that subsurface Farragut Avenue has a high density of utility and electrical corridors. Excavation using heavy equipment is not possible driving up project costs.

If this option were implemented full containment of anti-fouling spray painting operations would be unnecessary. Proposed DD BMP 5 (see Attachment 7) would be modified if this option were selected to allow uncontained spray painting.

Table 14-2: Option 1 Order-of-Magnitude Cost Estimate

Cost Component/Area	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Farragut North	74,361	67,627	94,834	31,930	47,558	369,758	0	0	686,069
Farragut South	72,289	30,069	21,543	87,819	59,291	120,490	52,557	79,567	523,626
Track Drains	647,031	769,768	924,376	848,412	1,691,039	2,689,777	0	0	7,570,403
Pier Drains	769,441	961,802	0	846,712	846,091	692,301	42,225	0	4,158,573
Equipment	21,747	28,137	16,817	21,747	21,747	28,137	40,147	40,147	218,627
Tanks	35,895	38,559	42,895	40,138	42,739	42,701	45,088	44,105	332,121
Total	1,620,766	1,895,963	1,100,465	1,876,759	2,708,466	3,943,164	180,018	163,819	13,489,420

Notes:
- Cost in Thousands
- Operation & Maintenance costs for this option were not estimated.
- Estimated service life is 20 years.

14.4.4.2 Option 2 – Heavy Industrial Zones Treatment.

Instead of treating stormwater from all eight (8) zones, per Option 1, this option is to capture and treat stormwater from only the heavy industrial zones, which are 1 through 6. This option excludes modification of the crane rail system and excludes stormwater from the piers. The piers

are excluded since heavy industrial activity does not occur there. Most stormwater from the crane tracks will eventually runoff into standard catch basins or evaporate.

Not treating stormwater from zones 7 and 8 is reasonable based on their distance from industrial activities surrounding the application of copper anti-fouling paints.

The order-of-magnitude cost for Option 2 is 773 million dollars. Table 14-3 is a breakdown of the noted cost. Attachment 10 contains a detailed breakdown of costs for each component of each zone.

Table 14-3: Option 2 Order-of-Magnitude Cost Estimate

Cost Component/Area	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Total
Farragut South	72,289	30,069	21,543	87,819	59,291	120,490	
Equipment	21,747	28,137	16,817	21,747	21,747	28,137	
Tanks	35,895	38,559	42,895	40,138	42,739	42,701	
Total	129,931	96,766	81,256	149,705	123,777	191,328	772,763

Notes:
- Cost in Thousands
- Operation & Maintenance costs for this option were not estimated.
- Estimated service life of treatment systems is 20 years.

As mentioned above, the majority of the costs detailed in Option 1 are associated with capture and treatment of water from track drains, (7.6 billion dollars), and pier drains, (4.2 billion dollars). Together these two areas account for over 87% of the overall cost but only constitute only about 10% of the total area drained. This option eliminates those costs but technically incurs some additional costs associated with treating a greater volume of stormwater. This increase in volume, related to additional treatment capacity, is not significant in the context of the order-of-magnitude cost estimate, and not included.

If this option were implemented full containment of anti-fouling spray painting operations would be unnecessary. Proposed DD BMP 5 (see Attachment 7) would be modified if this option were selected to allow uncontained spray painting.

14.4.4.3 Option 3 – Primary Source Control and Enhanced Surface Cleaning.

Implementing the process controls outlined in Section 15.0 and Attachment 7, including enclosing all copper anti-fouling spray painting operations along with enhanced street sweeping, PSNS&IMF can significantly minimize stormwater pollutants. A more detailed study would be required to gain an accurate cost estimates for this option, rough estimates indicate that monthly street sweeping using advanced sweepers will cost approximately 1.5 million dollars per year. The capital cost of a high efficiency street sweeper is approximately $412,000.

Enclosing or eliminating spray painting of copper anti-fouling paints could be accomplished for between 20 and 50 million dollars per year depending on workload. For the purposes of comparison, a value of $35,000,000 was used. This option will result in the least amount of disruption to PSNS&IMF operations. Table 14-4 contains cost information for this option.

Table 14-4: Option 3 Order-of-Magnitude Cost Estimate

Cost Component/Area	Capital Cost	Annual Cost
Street Sweeper	$412,000	$2,000
Cleaning labor	NA	$1,500,000
Containments	not included	$35,000,000
Total	$412,000	$36,502,000
Note: The estimated service life of the street sweeper is 20 years		

14.4.5 AKART Determination

Table 14-5 is a cost and impact to production comparison for the three options.

Table 14-5: Options Cost Comparison and Impact to Production

Option	Capital Cost	Annual Cost	Present Value	Present Value Cost per kilogram Copper Removed Annually	Impact to Production
Option 1	$13,489,420,000	not estimated	$13,489,420,000	$1,191,526,920	Severe
Option 2	$772,763,000	not estimated	$772,763,000	$68,225,949	Significant
Option 3	$412,000	$36,502,000	$596,448,020	$52,643,250	Low

Notes:

- Service life of treatment systems and street sweeper estimated at 20 years.
- The annual operating costs for Option 1 and 2 were not estimated since they are already the higher cost options. The added information would be of little value in evaluating the options.
- Interest/inflation rate estimated at 2 percent.
- Annual PSNS&IMF discharge of copper in stormwater estimated at 11.33 kilograms, see Attachment 9.
- Copper removal for all three options was "estimated" at 100 percent for purposes of this table. Option 1, however, would remove copper to a high degree than Options 2 and 3.

Because of the size of the industrial area, and the age and complexity of its sub-surface infrastructure, capturing and conveying stormwater to treatment is unreasonably expensive and would also be extremely disruptive to PSNS&IMF's mission. Given the inherent inaccuracies in order-of-magnitude cost estimating it is clear that the cost of Option 1, at over a billion dollars, is not economically reasonable and therefore not AKART. Additionally, the impacts to production in constructing this option would be severe due to crane track work, reinforcing the AKART determination. Similarly, Option 2 is not economically reasonable and therefore not AKART. While Option 2 impacts to production are not as severe as Option 1, they would be significant as construction progressed.

While Option 3 is the least cost of the three options, it is still at a level making it economically unreasonable and not AKART. Even considering that Option 3 is above the AKART range, PSNS&IMF will carry out this option. Option 3 will result in the least amount of disruption to production and primarily relies on source control to control pollutants. The use of source control is and will continue to be PSNS&IMF's primary means to control pollutants. The street sweeping aspect is added insurance to control pollutants.

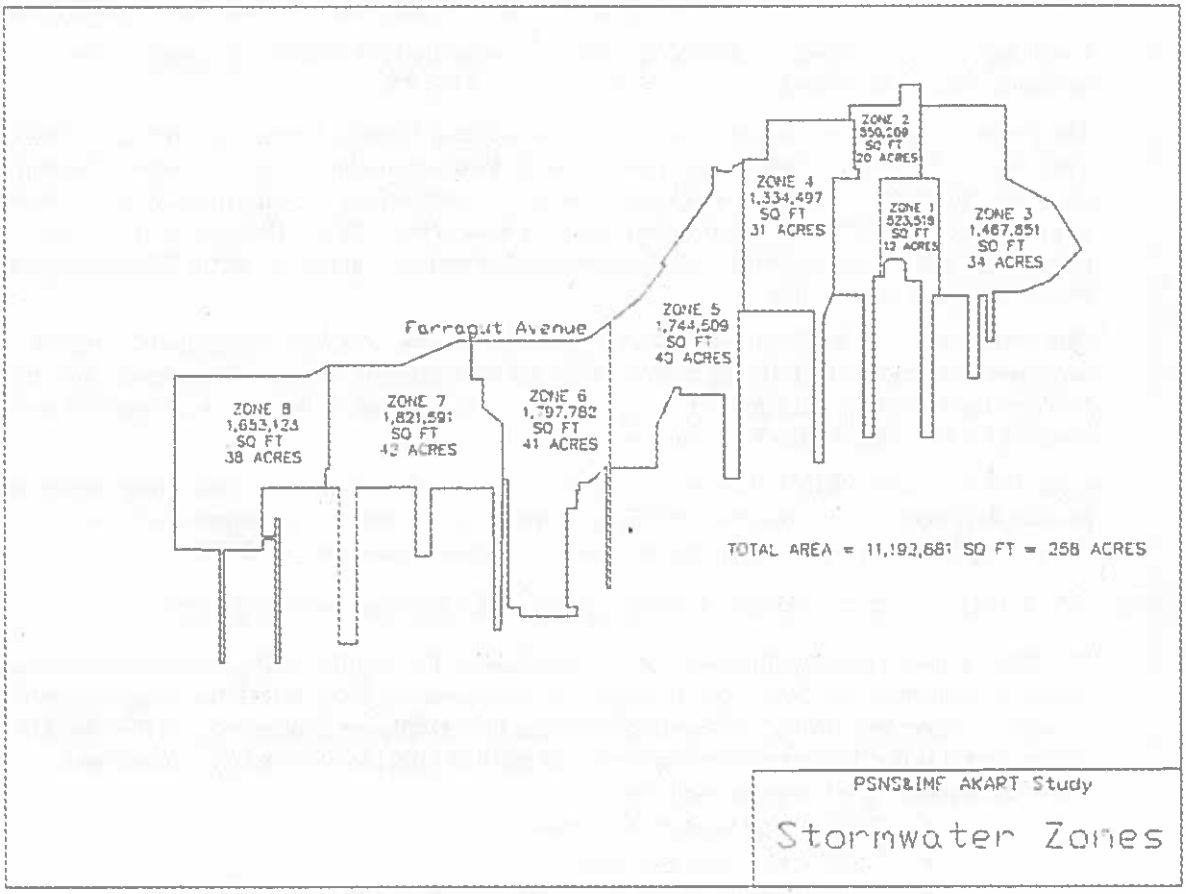

Figure 10: Stormwater Zones

15 Conventional Best Management Practices AKART Analysis

Evaluation of the conventional BMPs currently employed by PSNS&IMF was compared to similar facilities and related permits to help determine AKART.

The permits selected for evaluation are EPA's Multi-Sector General Permit (MSGP) (EPA 2000), Todd Pacific Shipyards Corporation (Todd), and the Washington State Boatyard General Permit (Ecology 2005) (Ecology Boatyard General Permit). A comparison was also made with the BMPs in the PSNS&IMF NPDES Working Draft Permit (WDP) (EPA 2008). Because BMPs of one permit typically do not match up with those on another permit, comparison of the BMPs on a one-to-one basis was not possible.

Due to the number of BMPs in the WDP, the AKART analysis was done in two parts. First is a comparison of PSNS&IMF BMPs to those in EPA's MSGP (EPA 2000), Todd's permit, and the Ecology Boatyard General Permit (Ecology 2005) was completed. Following, a comparison was made of the PSNS&IMF BMPs to those in the WDP.

Code 106 is the PSNS&IMF Environment, Safety, and Health Office. Code 106 is responsible, in part for developing policy related to NPDES compliance. Included in this responsibility is developing BMPs and conducting inspections to help ensure adherence to BMPs.

15.1 Current PSNS&IMF BMP Implementation

PSNS&IMF uses a variety of means to implement BMPs. For simple BMPs, implementation may simply be education and awareness. For the most part, however, PSNS&IMF has programs/policy in place to implement BMPs. This section describes how BMPs are implemented at PSNS&IMF. Attachment 3 is the full text of each conventional BMP in effect at PSNS&IMF. Attachment 5 has BMP supporting information including:

- BMP – Type Controls Overview
- Portable Fuel Storage Tanks
- Shipyard, Ships Force, and Contractor Over-Site at the Deck Plate
- Contractor Water Pollution Prevention
- Dry Dock Inspections
- Dry Dock and Stormwater Inspections
- Code 106.32 Storm Drain Discharge Approval Form

Attachment 7 contains proposed new BMPs designed to bring PSNS&IMF in line with current AKART standards.

Below for each current PSNS&IMF BMP, is a brief description of how it is implemented.

BMP 1 Yard Clean up. The Bremerton Naval Complex will be cleaned on a monthly basis to minimize the loss of accumulated debris into Sinclair Inlet. For NBK Bremerton, each building has an assigned building manager responsible for cleanliness around the building. PSNS&IMF has established cleanliness zones in addition to building managers. Each zone manager is responsible for the cleanliness of their zone. When there is an cleanliness issue within any of these zones, the building manager is contacted first and then the zone manager. A map of the BNC showing the 13 cleanliness zones is included in Attachment 5.

BMP 2 Dry Dock Cleanup. Personnel working in the dry dock will clean the dock by the end of each shift. Inspections are performed daily by the project ESH (Environmental, Safety, and Health) Manager. The Project Superintendent, or his/her designee, is notified when cleanliness issues are found. Clean up is performed and the project ESH Manager is notified concerning the corrective action taken.

Code 106 conducts monthly dry dock inspections. The Project Superintendent or his/her designee accompanies Code 106 during the inspection process. Typically, cleanliness findings are quickly corrected. Code 106 completes a summary inspection report, which is provided to senior management. In the inspection, Code 106 evaluates a number of criteria such as general dry dock cleanliness and housekeeping, and control and cleanup of spills, drips, and leaks. Each criterion is graded as satisfactory or unsatisfactory. A re-inspection will occur if unsatisfactory conditions are observed. (see Attachment 5, Dry Dock Inspections)

Code 106 performs a cleanliness inspection prior to each dry dock "flooding." Flooding can not commence until Code 106 signs the Docking Officer's flooding pre-requisite sheet certifying that the dock has met all of the cleaning requirements. Interface Engineering Instruction 248.37 is the PSNS&IMF guidance document for dry dock cleaning. (see Attachment 5, Dry Dock and Stormwater Inspections)

BMP3 Materials Storage and Handling. PSNS&IMF implements a robust hazardous material program that ensures hazardous material is stored properly. PSNS&IMF Instruction P4110.1E govern hazardous material storage. 40 CFR 63.783, National Emission Standards for Shipbuilding and Ship Repair, outlines the requirements for storage and use of paint in containers. Flammable and combustible liquids are controlled by NFPA (National Fire Protection Association) 30.

Hazardous material obtained on projects is issued to workers at an assigned hazardous material area. Workers return products to the storage lockers at the end of shift. Project ESH Managers educate supervisors and workers about worksite material storage and handling using the ESH weekly project brief and attending daily project meetings.

BMP 4 Containment and Control of Dust and Overspray. Dry blasting operations are performed inside of containments with ventilation and filtration. See Section 7.0. All air emitting operations are regulated under the PSNS&IMF Clean Air Act Title V permit. Examples of regulated activities include dry blasting, combustion processes, painting, thermal cutting, power generation, and fugitive dust. Instruction 5090.10C implements Title V requirements at PSNS&IMF. Specific processes that could release dust and overspray are controlled through implementation of Industrial Process Instructions (IPI). IPI 0630-901A, Abrasive Blasting of Ships, and IPI 0631-905B, General Painting Requirements, provide guidance for control of dust and overspray.

Project ESH Managers educate supervisors and workers about water pollution concerns of dust and overspray using the ESH weekly project brief and attending daily project meetings.

BMP 5 Drip Pans. Drip pans are utilized during processes where drips may occur. PSNS&IMF Instruction P5090.9E, Spill Prevention Plan, has additional detailed direction concerning spill prevention. Project ESH Managers educate supervisors and workers about drip pans and spill prevention using the ESH Weekly project brief and attending daily project meetings. Code 106 publishes articles regarding BMPs in the PSNS&IMF ESH newsletter.

BMP 6 Vehicle/Equipment Cleaning. Code 106 publishes articles regarding BMPs, including Vehicle/Equipment Cleaning in the PSNS&IMF ESH newsletter. Additionally, Code 106 publishes a separate newsletter to educate the shipyard community about BMPs and performs facility inspections to further reinforce the importance of BMPs.

BMP 7 Vehicle and Equipment Preventive Maintenance. Generally the types of vehicles and equipment maintenance that PSNS&IMF maintains includes forklifts, aerial work platforms, cranes, railroad, and various types of material handling equipment. Most maintenance is performed either in or in the vicinity of Building 455. The Shipyard leases most of the automobiles it uses and these are sent off-site for maintenance.

BMP 8 Material Loading/Unloading. Loading and Unloading of liquids and fine granulated materials in outdoor areas requires the personnel doing the activity to protect all storm drains around the site. This is accomplished by use of rubber mats, valved drains, or other protective devices on hand for use to protect the drains. The mats are put over the drains, valves closed (if so equipped), or other actions are taken to protect the drains during loading/unloading. The facility manager maintains a spill kit at the site stocked for the type materials received and shipped. Code 106 inspects loading/unloading areas on a monthly basis.

BMP 9 Over-Water Work. Vessel work not performed in a dry dock is considered to be over-water work, and must be performed such that nothing enters Sinclair Inlet. For ships force, the responsibility of preventive measures rests with the Chief Engineering Officer, and those in management positions under him/her. Personnel who work for PSNS&IMF must comply with the requirements of Instruction P5090.30, Water Pollution Prevention and Control Plan. PSNS&IMF personnel must take a mandatory training class once a year, which includes the topic of water pollution prevention and control. Project personnel and contractors are monitored mainly by Code 106 ESH Managers for the project. Contractors must comply with all federal, state and local environmental regulations pertinent to and required within the Bremerton Naval Complex. Contractors have oversight personnel on site to monitor activities. (See Attachment 5, Contractor Water Pollution Prevention.)

BMP 10 Treated Wood Products. Treated wood products in use or in storage within the BNC are managed by the personnel using the material, or the facility that is responsible for storage of the material. In both cases, when the material is not in use, it is covered with a tarp. New material is shipping with a cover in place. On a daily basis Code 106 ESH Managers monitor treated wood use and storage on a project, as referenced in PSNS&IMF Instruction P5090.30, Water Pollution Prevention and Control Plan.

BMP 11 Discharges into Storm Drains. Discharges into storm drains other than those authorized by NPDES permit WA-000206-2, are prohibited. The permit, however, allows certain non-stormwater discharges such as water line flushing. Any party to perform work that will result in an allowed stormwater discharge must submit a Storm Water Discharge Approval Form to Code 106 for prior approval (Attachment 5 has a copy of this form). Code 106 may conduct a site inspection and/or a conference with the requesting personnel may be requested. The discharge approval process is implemented through PSNS&IMF Instruction P5090.30. Discharge can not commence until Code 106 signs the discharge approval form.

BMP 12 Storm Sewer System Cleaning and Maintenance. The PSNS&IMF Public Works Department uses a vacuum truck to clean catch basins annually and on an as needed basis. Oil/water separators are inspected twice a year and cleaned as necessary by a contractor.

BMP 13 Outdoor Work Operations. Personnel conducting outdoor work operations must take preventative measures to minimize impact to stormwater. The backbone of these preventative measures is education. PSNS&IMF personnel must take a mandatory training class once a year, which includes a section on water pollution prevention and control. Examples of outdoor work operations include paint application done outside a dry dock, metal cutting and grinding, and carpentry. This BMP is reinforced via the annual training and if associated with a project the weekly ESH Newsletter, which is targeted specifically to work processes, related to the project.

15.2 PSNS&IMF BMP Evaluation with Similar Facilities and Permits

This is a broad evaluation of the BMPs currently employed by PSNS&IMF compared to similar facilities and related permits. A one-to-one comparison is not possible because BMPs in one permit typically do not match up with those in another permit. The evaluation will look at requirements in other permits and see how they compare to BMPs employed by PSNS&IMF. The text is organized in bulleted fashion first by the permit, then by the title of the BMP; following this is a discussion of how the BMP compares to PSNS&IMF BMPs and policy. The three permits selected for evaluation are EPA's Multi-Sector General Permit (MSGP) (EPA 2000), Todd Pacific Shipyards Corporation (Todd), and the Washington State Boatyard General Permit (Ecology 2005) (Ecology Boatyard General Permit).

- MSGP - Blasting and Painting Area: The BMP states consider containing all blasting/painting activities or use other measures to prevent or minimize the discharge. PSNS&IMF requires performing all dry-blasting operations within an enclosure with adequate dust collection. Spray painting operation must be performed to contain overspray and spillage, and minimize emission of particulates. This MSGP requirement is reasonably similar to that employed by PSNS&IMF however, at PSNS&IMF dry blasting in containments is mandated.
- MSGP - Dry dock Activities: BMP requirement is to describe maintaining/cleaning the dry dock. It does not have specific requirements but does state: Consider the following (or their equivalents): sweeping rather than hosing off debris/spent blasting material from accessible areas of the dry dock prior to flooding, and having absorbent materials and oil containment booms readily available to contain/cleanup any spills. PSNS&IMFs BMP 2, Dry Dock Cleanup, prohibits hosing down the dry dock floor and requires cleanup prior to the end of each work shift. PSNS&IMF BMPs are more specific about cleaning requirements than the MSGP BMP.
- MSGP - General Yard Area: Requirement is to implement and describe a schedule for routine yard maintenance and cleanup. PSNS&IMF BMP 12, Storm Sewer System Cleaning and Maintenance, addresses inspection and maintenance of the storm sewer. BMP 1, Yard Cleanup, addresses general Shipyard cleanup. PSNS&IMF BMPs and the MSGP BMP are reasonably similar.
- Ecology Boatyard General Permit - Vacuum sander: The Boatyard permit requires use of a vacuum sander for all paint removal where a sander is appropriate. While PSNS&IMF does use vacuum sanders, there is no specific BMP requirement.
- Ecology Boatyard General Permit - Solids Management: BMP requires daily cleaning when "solids-generating activity is occurring" and cleaning dry docks prior to flooding. PSNS&IMF BMP 2, Dry Dock Cleanup, implements substantially similar requirements. PSNS has a separate instruction that encompasses requirements for dry dock cleaning per operational situations.
- Ecology Boatyard General Permit - Oils and Bilge Water Management: BMP requires use of drip pans and other measures to catch incidental leaks and spills for all petroleum product transfer operations. PSNS&IMF BMP 5, Drip Pans and Secondary Containments, implements a similar requirement.
- Todd - Control of Large Solid Materials: This BMP requires cleaning the dry dock floor prior to flooding. It is substantially similar to PSNS&IMF BMP 2 Dry Dock Cleanup.

BMP 3, Material Storage and Handling, requires storage of both spent and virgin sandblast grit under cover and elimination of contact between process or storm water and abrasive grit. PSNS&IMF also has a dry dock cleaning instruction separate from the BMPs.

- Todd - Control and Cleanup of Paint Dust and Abrasive Blasting Debris:
  - BMP requires control of paint overspray and blasting dust by conducting work in "special sandblast/spray paint shed, or plastic barriers around the vessel. The BMP recommends consideration of innovative procedures including steel grit blasting. PSNS&IMF employs innovative methods by using hull crawlers and steel grit blasting (with grit recycle).
  - The BMP prohibits abrasive blasting or spray painting while the vessel is pier-side. PSNS&IMFs BMP 9, Over-Water Work, requires protection to prevent any and all debris from entering Sinclair Inlet; however, there are no prohibitions from blasting or spray painting pier-side inside containments.
  - The BMP requires photographs be "taken and maintained in a logbook to demonstrate the condition of the dry dock floor prior to launching a vessel. PSNS&IMF BMP 2, Dry Dock Cleanup, requires monthly and prior-to-flood inspections. Photographs, are not taken, because the dry dock area is so large as to require an significant number of photographs and PSNS&IMF security issues.
  - The BMP requires the yard to be cleaned with either sweeping or vacuuming. PSNS&IMF BMP 1, Yard Cleanup, is substantially similar to the Todd BMP and to MSGP "General yard area"
- Todd - In-Water Vessel Maintenance Surface Preparation BMPs: PSNS&IMF BMP 9, Over Water Work addresses this issue.
  - The BMP prohibits cleaning of the hull below the waterline while pier-side. PSNS&IMF has a written policy prohibiting hull scrubbing but allowing, with restriction, sea growth removal. (IPI 5090.40)
  - The BMP goes on to describe types of pier-side, above the waterline, surface preparations that are allowed. While not as specific as PSNS&IMF BMP 9, Over-Water Work, it institutes similar requirements although in less detailed form.
- Todd - BMPs for Floats used for In-Water Vessel Maintenance: The BMP specifies precautions to prevent materials and wastes from entering surface waters. The main requirement is secondary containment. PSNS&IMF BMP 3, Material Storage and Handling, requires placing material inside secondary containment, inside a covered area, or underneath tarps. The PSNS&IMF BMP 3 is not as specific as the requirements imposed by the Todd permit, however PSNS&IMF BMP 9 addresses over water work requirements.
- Todd - Documentation Requirements for In-Water Vessel Maintenance BMPs: Documentation, including photographs and written narrative, is required. PSNS&IMF has no similar requirement.
- Todd - Oil, Grease, and Fuel Spills Prevention and Containment: This BMP prohibits discharge of hazardous materials, oil, grease, fuel, or paint to state water. PSNS&IMF has similar requirements in its Oil Spill Prevention and Counter Measure Plan.

- Todd - Paint and Solvent Use and Containment: Requires protective measures when mixing paints and solvents through use of drip pans, activity location controls, and tarpaulins. PSNS&IMF BMP 3, Material Storage and Handling, imposes similar requirements such as storing materials "in a protected, secure location, and away from drains. Proper protection methods include placing material inside a cofferdam [secondary containment], inside a covered area, underneath tarps, or using rubber mats over storm drains."
- Todd - Contact Between Water and Debris: BMP requires directing cooling and non-contact cooling water to minimize contact with spent abrasive, paint chips, and other debris. PSNS&IMFs BMP 3, Materials Storage and Handling, specifies elimination of contact between process or storm water and abrasive grit. The BMPs are substantially similar.
- Todd - Maintenance of Hoses, Soil Chutes, and Piping: BMP requires leaks of hoses be replaced or repaired immediately. PSNS&IMF BMP 5, Drip Pans, requires immediate repair, replacement, or isolating leaking connection, valves, pipes, and hoses. The BMPs are substantially similar.
- Todd - Bilge and Ballast Water: BMP imposes 10 mg/l Oil & Grease and "no visible sheen" limits for direct discharge. PSNS&IMF does not direct discharge bilge water. It is collected, treated at an OWTS, and discharged into the sanitary sewer per State Waste Discharge Permit (SWDP) requirements. PSNS&IMF accomplishes a higher level of environmental control than in the Todd BMP.
- Todd - Chemical Storage: This BMP specifies chemical storage requirements to prevent their inadvertent entry into waters of the state. PSNS&IMF BMP 3, Materials Storage and Handling, requires protecting containers "storing liquid wastes or other liquids, which have the potential of adding pollutants to water (e.g., fuels, paints, and solvents), from the weather in a protected, secure location, and away from drains." The two BMPs are reasonably similar; however, the PSNS&IMF BMP is less definitive. PSNS&IMF has chemical storage requirements other than the BMP.
- Todd - Education of Employees, Contractors, and Customers: BMP requires development of program and subsequent training of employees, contractors, and customers. PSNS&IMF has a similar requirement implemented through instruction 5090.30, Water Pollution Prevention and Control Plan, which states:

  > a. Water Pollution Prevention Practices training will be accomplished using a combination of formal classroom sessions, stand-up safety and environmental meetings, and ESH [Environment, Safety, and Health] and newsletters.
  >
  > b. Continuous training sessions will include each of the BMPs of Attachment B1 at least once annually. Additional training will be accomplished on a case-by-case basis where justified by specific BMP incidents, changes in NPDES Permit requirements, or other identified needs.
  >
  > c. Training will be provided to contractors and Ship's Force personnel whose jobs are included within the scope of this document. Supervisors will receive additional training, as needed, on the specific nature of their responsibilities in implementing the BMP Plan.

  The Todd BMP and the PSNS&IMF requirement in instruction 5090.30 are substantially similar.

- Todd - Sewage and Gray Water Discharges Prohibited: BMP requires notification to vessel owners that discharge of sewage and gray water, while pier-side, is prohibited. The aforementioned PSNS&IMF instruction requires:

  > All black and gray water (for those ships equipped to discharge to Collection, Holding, and Transfer (CHT) Tanks), as defined in Appendix A, shall be collected and transported to the Shipyard sanitary sewer system through the CHT System.

  The Todd BMP and the PSNS&IMF requirement in instruction 5090.30 are substantially similar.

- PSNS&IMF - Storm Sewer System Cleaning and Maintenance: Evaluating BMPs from other facilities did not reveal a similar BMP to this one at PSNS&IMF. Norfolk Naval Shipyard has the following BMP:

  > The sediment traps in the storm water drainage systems for graving docks and other industrial areas where solid pollutants such as grit blast, paint, and welding slag can accumulate shall be inspected and cleaned as necessary to ensure the interception and retention of solids entering the drainage system. Inspection logs and cleaning records must be maintained.

For the most part PSNS&IMF's BMPs and policy are reasonably similar to those in other facility/permits evaluated. There are some that do not match as follows (See Attachment 7 for resolution of these issues):

- Ecology Boatyard General Permit – Vacuum sander: The Boatyard permit requires use of a vacuum sander for all paint removal where a sander is appropriate. While PSNS&IMF does use vacuum sanders there is no specific BMP requirement.
- Todd – Control and Cleanup of Paint Dust and Abrasive Blasting Debris:
  - The BMP prohibits abrasive blasting or spray painting while the vessel is pier-side. PSNS&IMF's BMP 9, Over-Water Work, requires complete containment of debris to prevent any discharge from entering Sinclair Inlet, which is essentially equivalent. Because of the high cost of preparing containments for over water work, PSNS&IMF avoids this option whenever possible.
- Todd – In-Water Vessel Maintenance – Surface Preparation BMPs:
  - The BMP prohibits cleaning of the hull below the waterline while pier-side. PSNS&IMF has a written policy prohibiting hull scrubbing but allowing, with restriction, sea growth removal. This is consistent with the marine pollutant control device specified in the Uniform National Discharge Standards contained in the Clean Water Act.
- Todd – BMPs for Floats used for In-Water Vessel Maintenance: The BMP specifies precautions to prevent materials and wastes from entering surface waters. The main requirement is secondary containment. PSNS&IMF BMP 3, Material Storage and Handling, requires placing material inside secondary containment, inside a covered area, or underneath tarps. The PSNS&IMF BMP is not as specific as that in the Todd permit.
- Todd – Chemical Storage: This BMP specifies chemical storage requirements to prevent their inadvertent entry into waters of the state. PSNS&IMF BMP 3, Materials Storage and Handling, requires protecting containers "storing liquid wastes or other liquids, which have the potential of adding pollutants to water (e.g., fuels, paints, and solvents),

from the weather in a protected, secure location, and away from drains." The two BMPs are reasonably similar; however, the PSNS&IMF BMP is less definitive.

- Todd – Recycling of Spilled Chemicals and Rinse Water: BMP requires recycling or reuse of spilled chemicals or proper disposal. PSNS&IMF has no equivalent BMP, however, PSNS&IMF does required that spills be cleaned up and disposed of properly per a PSNS&IMF instruction.
- PSNS&IMF - Storm Sewer System Cleaning and Maintenance: BMP requires inspection of catch basins and maintenance when the sump is one-third of full.

15.3 BMPs in the Working Draft Permit

The WDP includes a number of BMPs, which are in Attachment 6.

15.4 PSNS&IMF BMP Evaluation with Working Draft Permit

The WDP BMPs were consolidated, for purposes of evaluation with PSNS&IMF BMPs as outlined below.

- Vacuum Sander – Required of all facilities: A vacuum sander or rotary tool meeting minimum performance standards shall be used for all paint removal where a sander is appropriate. Non-vacuum grinders are prohibited. PSNS&IMF uses vacuum sanders; however, there is no specific requirement to do so.
- Solids Management: All particles, oils, grits, dusts, flakes, chips, drips, sediments, debris and other solids from work, service, and storage areas of the boatyard shall be collected to prevent their release into the environment and entry into waters of the state. The minimum collection frequency is once per day when solids-generating activity is occurring. Solids shall be kept as dry as possible during collection and shall not be washed into any surface water or into a storm water collection system. PSNS&IMF BMPs 1, 2, 3, 4, 8, 11, and 13 address the control, prevention, collection, loading, unloading, storage, and deposition of materials.
- Dry Dock Cleaning: Marine railways and dry docks shall be cleaned of all solids and garbage prior to being submerged to prevent such materials from being washed into waters of the state. Sediment traps shall be installed in all storm drains to intercept and retain solids prior to their discharge into waters of the state. Sediment traps, storm drains, and catch basins shall be visually inspected weekly and cleaned, either manually or with a vacuum device, on a routine basis to prevent the entry of solids into waters of the state. PSNS&IMF has a Dry Dock cleaning instruction that addresses the procedures for cleanliness before and after flooding. It also addresses the cleanliness of the dry docks during Project Availability. PSNS&IMF BMP 12 addresses the cleaning and maintenance of catch basins. With 1,807 catch basins, inspection of them all once a week would be prohibitive.
- Oils and Bilge Water Management: Drip pans or other containment devices shall be used during all petroleum product transfer operations to catch incidental leaks and spills. Absorbent pads and/or booms shall be available during petroleum transfer operations occurring over water. PSNS&IMF BMP 5, covers using drip pans, and other containment devices for liquid transfers. In addition to the BMP, PSNS&IMF has an Oil Spill Prevention and Counter Measure Plan (SPCC).

- Blasting and Painting Area: Implement and describe measures to prevent spent abrasives, paint chips, and over spray from discharging into the receiving water or the storm sewer system. Consider containing all blasting/painting activities or use other measures to prevent or minimize the discharge the contaminants (e.g., hanging plastic barriers or tarpaulins during blasting or painting operations to contain debris). Where necessary, regularly clean storm water conveyances of deposits of abrasive blasting debris and paint chips. PSNS&IMF BMP 4, Containment and Control of Dust and Overspray, addresses blasting and painting operations and the control thereof. PSNS&IMF's requirements are very similar to WDP Blasting and Painting requirements.

15.5 BMP Evaluation Results

After evaluating PSNS&IMF existing BMPs and comparing to similar facilities and permits (including the WDP), PSNS&IMF determined that the existing BMPs needed some modification; and new ones added. To better organize and direct BMPs, they were divided into two categories; dry dock and non-dry dock. Table 15-1 lists those PSNS&IMF BMPs needing modification in order to achieve the AKART standard. Attachment 7 is the full text of the proposed new and revised PSNS&IMF BMP. Attachment 8 cross references the proposed PSNS&IMF new BMPs with those in the WDP.

Table 15-1: PSNS&IMF BMPs Requiring Modification

BMP Number	BMP Title
BMP 1	Yard Cleanup
BMP 2	Dry Dock Cleanup
BMP 3	Materials Storage and Handling
BMP 4	Containment and Control of Dust and Overspray
BMP 5	Drip Pans
BMP 6	Vehicle/Equipment Cleaning
BMP 7	Vehicle and Equipment Preventive Maintenance
BMP 8	Material Loading/Unloading
BMP 9	Over-Water Protection
BMP 10	Treated Wood Products
BMP 11	Discharges into Storm Drains
BMP 12	Storm Sewer System Cleaning
BMP 13	Outdoor Work Operations

The sections below provide a brief summary of why the BMP was modified, or if a new BMP, why it was added.

15.5.1 Discussion: Non-Dry Dock Revised BMPs

BMP 1 Yard Cleanup: BMP is too general in addressing the area and responsibility regarding cleanup. The revised BMP will include more detail on responsibilities and requirements.

BMP 2 was dry dock cleaning. It is addressed in dry dock BMPs.

BMP 3 Material Storage and Handling: BMP was very broad in addressing the pollutants, and methods of containment. The revised BMP will address requirements in specific pollutant categories.

BMP 4 Containment and Control of Dust and Overspray: This BMP was too general in its approach for dust and overspray control. The revised BMP will address the operations that produce dust and overspray individually, and be more definitive on control and use.

BMP 5 Drip Pans: Addressed the use of protective devices and drip pans for the control of leaking connections and as precautions when breaking a connection. The revised BMP will include using secondary containments with portable equipment.

BMP 6 Vehicle/Equipment Cleaning: This BMP addressed where vehicles and equipment may be washed. The revised BMP is basically the same as the old one, with the exception that the building locations were added for reference.

BMP 7 Vehicle and Equipment Preventive Maintenance: This BMP addressed the frequency of inspection of vehicles, the requirement for maintaining them, and management of equipment and vehicles before and when in a dry dock. The revised BMP will remove the dry dock requirement, and have it addressed in the dry dock BMPs. It also changes the frequency of inspections.

BMP 8 Material Loading and Unloading: This BMP addressed the control of pollutants by installation of more permanent controls with the mention of rubber mats. The revised BMP approaches the actions by addressing the protection of storm drains within a given area of the process/action. It also calls for spill kits applicable to the processes being performed.

BMP 9: Over-Water Protection: This addresses the protection of water by use of containments adjacent to and under working processes. It also addresses the type of processes that need to have protective measures used, and evaluation of wind conditions in relation to work being performed. The revised BMP will address the same type of processes, but is more definitive in the protection requirements for no debris getting into the waters. It will also give reference to a new, BMP 3. Included is the use of vacuum sanders for outdoor work.

BMP 10 Treated Wood Products: This BMP addresses the use and control of treated wood. There is no revised BMP.

BMP 11 Discharges into Storm Drains: This BMP addresses the control and authorization requirements for discharges into storm drains. The revised BMP states that nothing is allowed to be discharging to a storm drain without authorization. It also does not allow anything to be dumped on the ground.

BMP 12 Storm Sewer System Cleaning and Maintenance: This BMP addressed the cleaning and maintenance of the storm sewer catch basins and the criteria for evaluating the basins need for cleaning. It also addressed the responsible parties for inspecting the basins and the contact for having the basins cleaned. The revised BMP addresses the frequency for cleaning catch basins, a time frame for replacing filters, and the use of the appropriate filter for the pollutants in the drainage area.

BMP 13 Outdoor Work Operations: This BMP was too general regarding what to do when conducting outdoor work operations, and the items to have on hand for the control and clean up of debris. The revised BMP addresses more specifically the operations of outdoor work, the requirements for mixing paint, and the equipment to be on hand for cleanup and prevention.

15.5.2 Discussion: New Non-Dry Dock BMPs

Attachment 7 contains the full text of the proposed new and revised BMPs. Below is a discussion of the new non-dry dock BMPs.

New BMP 12 Outdoor Metal Work: This new BMP outlines the requirements for working with metal outside a building or dry dock. It addresses which operations are considered part of metal work.

New BMP 13 Common Trash Receptacles: The BMP addresses the requirements for the use of common trash containers.

New BMP 15: Fueling Areas: This BMP specifically addresses fueling of equipment and the use of portable fuel tanks (See Attachment 5, Portable Fuel Storage Tanks).

15.5.3 New or Revised Dry Dock BMPs

This section relays the rationale for each of the proposed new or revised dry dock BMPs. To distinguish the dry dock specific BMPs the nomenclature "DD" is added prior to "BMP." Attachment 7 contains the full text of the proposed new and revised BMPs.

DD-BMP 1 Dry Dock Cleaning: This BMP addresses the cleaning responsibility of personnel working in the dry dock, a dedicated cleaning crew for cleaning during a project, and the frequency of cleaning, and inspections. It also addresses recordkeeping and inspections efforts.

DD-BMP 2 Pre-Flood Cleaning: Pre-flood cleaning shall follow the requirements of IEI 248.37 (Dry Dock Cleaning) instruction.

DD-BMP 3 Post-Flood Cleaning: Post flood cleaning shall follow the requirements of IEI 248.37 (Dry Dock Cleaning) instruction.

DD-BMP 4 Material Storage and Handling: This BMP addresses Liquid Oil Hazardous Substance containers and the requirements of storage. It also addresses covering and containment of raw materials, the storage of non ferrous metals, and the requirement of regular inspections of these areas.

DD-BMP 5 Containment and Control of Dust and Overspray: This BMP addresses painting and dry abrasive blasting in the dry docks. It outlines the requirements for painting with sprayers and rollers when paint is copper based, and when it is non-copper based. It mandates all dry abrasive blasting, sanding, grinding and spray painting be conducted in enclosures with proper ventilation with an exception when using vacuum sanding or grinding devices

DD-BMP 6 Drip Pans and Secondary Containment: This BMP outlines the requirements for use of drip pans on hose connections and the requirement to replace or isolate leaking connections. It also addresses the requirement for small portable equipment to be in a secondary containment when operational.

DD-BMP 7 Equipment Preventive Maintenance: This BMP addresses checking for any leaks before placing equipment in a dry dock, inspecting the equipment for leaks when it is in dry dock, and what to do with a leaking piece of equipment.

DD-BMP 8 Treated Wood Products: This BMP addresses treated wood products, use and storage, in the dry docks.

DD-BMP 9 Discharges into Dry Dock Drainage System: This BMP addresses controls to minimize discharges into the dry dock drainage system, dry dock floor, and the necessary controls when hazardous materials are used in the dry dock.

DD-BMP 10 Outdoor Work Operations: This BMP is similar to the non-dry dock BMP for Outdoor Work Operations. It addresses the issues of containments, covering, and control and clean-up of debris.

DD-BMP 11 Outdoor Metal Work: This BMP addresses the requirements for working with metals in the dry dock (e.g. grinding, cutting, sanding, etc.), the effort for control of debris, and requirements for metal work areas that will be greater than one month long. It also addresses the use of filters for exhaust fans in metal work areas.

DD-BMP 12 Common Trash Receptacle: Outlines the requirements for use of common trash receptacles in the dry docks. The containers need to have covers, drain holes plugged, and the containers need to be covered at all times except when adding or removing trash.

Table 15-2 lists the titles of the proposed new and revised PSNS&IMF BMPs as a result of the AKART analysis.

Table 15-2: Proposed Final BMP List

Dry Dock BMPs		Non-Dry Dock BMPs	
DD-BMP 1	Dry Dock Cleaning	BMP 1	Yard Cleanup
DD-BMP 2	Pre Flood Cleaning	BMP 2	Material Storage and Handling
DD-BMP 3	Post Flood Cleaning	BMP 3	Containment and Control Of Dust And Overspray
DD-BMP 4	Material Storage and Handling	BMP 4	Drip Pans and Secondary Containment
DD-BMP 5	Containment and Control Of Dust and Overspray	BMP 5	Vehicle and Equipment Cleaning
DD-BMP 6	Drip Pans and Secondary Containment	BMP 6	Vehicle and Equipment Preventive Maintenance
DD-BMP 7	Equipment Preventive Maintenance	BMP 7	Material Loading/Unloading
DD-BMP 8	Treated Wood Products	BMP 8	Over-Water Protection
DD-BMP 9	Discharges Into Dry Dock Drainage System	BMP 9	Treated Wood Products
DD-BMP 10	Outdoor Work Operations	BMP 10	Discharges Into Storm Drains
DD-BMP 11	Outdoor Metal Work	BMP 11	Outdoor Work Operations
DD-BMP-12	Common Trash Receptacles	BMP 12	Outdoor Metal Work
		BMP 13	Common Trash Receptacles
		BMP 14	Storm Sewer System Cleaning
		BMP 15	Fueling Areas

15.5.4 Proposed New and Revised PSNS&IMF BMPs

Based on the AKART analysis, Attachment 7 contains the proposed new and revised BMPs for PSNS&IMF.

16 Steam Plant AKART Analysis

16.1 Background

While the AKART analysis of the Steam Plant follows the logic outlined in Section 4.0, there are some differences. Pollutants of concern, as outlined in Section 6.0, are not directly applicable to the Steam Plant. The Section 6.0 pollutants of concern were developed based on other shipyards and related permits and are not applicable to the Steam Plant. The primary reason the Steam Plant AKART analysis was completed is due the temperature limit in the Working Draft Permit (EPA 2008). As noted in Table 16-2 PSNS&IMF would likely exceed the proposed temperature limit.

The AKART analysis looked not only at effluent treatment but boiler feedwater treatment since this directly affects the quality of the water that may need treatment and is ultimately discharged.

The Steam Plant is located in the southwest corner of the Bremerton Naval Complex. The primary facility is Building 900. The associated Wastewater Treatment Plant is located in Building 912, which is adjacent to Building 900. Figure 1 shows the location of the Steam Plant and the approximate location of Outfall 021. The outfall has a 40 ft. long diffuser section of ductile iron pipe with multiple 3-inch drilled ports to discharge effluent.

The Steam Plant has three 140,000 steam lbs/hr capacity natural gas fired boilers. The Steam Plant's total capacity is 280,000 steam lbs/hr, with one boiler on standby.

The plant provides steam for the Bremerton Naval Complex; used for space and water heating, and industrial processes. Not all buildings are steam heated or have steam service. Some have their own internal boilers and water heaters.

There are five emergency diesel generators within Building 900 that have a capacity of 11,500 KVA (Kilo Volt Amperes). Additionally there is a large air compressor in Building 900 that supplies compressed air to the industrial areas of PSNS&IMF.

16.2 Boiler Feedwater and Wastewater Sources

Potable water from the City of Bremerton is fed to four carbon filters that remove free chlorine and particulate matter before entering the demineralizers. When differential pressure across the carbon filters exceeds a set-point filter backwash is initiated. Water from filter backwash is directed to Building 912, Wastewater Treatment Plant.

There are four primary demineralizers in the Building 900 to remove silica and ionic impurities in the boiler feedwater. There are two separate resin beds for each demineralizer. One is the cation bed and the other is the anion bed. The cation bed removes undesirable positively charged ions such as calcium, magnesium, sodium, potassium and iron. The anion bed removes undesirable negatively charged ions such as silica, chlorides, sulfates and nitrates. When the quality of the processed feedwater degrades a set amount, regeneration must be accomplished. A solution of sodium hydroxide (NaOH) is used to regenerate the anion bed. A solution of sulfuric acid (H2SO4) is used to regenerate the cation bed. Wastewater from the demineralizer regeneration process is directed to Building 912, Wastewater Treatment Plant.

In addition to the boiler feedwater treatment described above, chemical treatment is necessary for maintaining and protecting the integrity of the boilers and steam distribution system. Three chemicals are used for this purpose. They have the following purpose:

- Control the buildup of scale and sludge in the boiler and distribution system.
- Reduce corrosion and pitting.

- Provide protection of the condensate return lines at initial points of condensation and at the far ends of the condensate return system.

16.3 Overview of the Wastewater Treatment Plant, Building 912

The Wastewater Treatment Plant functions to clean and treat miscellaneous wastewaters generated within the Steam Plant and throughout the plant complex. The wastewater is collected by various drainage systems that are routed to Building 912. Sources and the treatment process are described below:

CORROSIVE DRAINS – As describe above these streams originate from demineralizer regeneration. The waste flows into two separate 25,000 gallon containments called Demineralizer Waste Neutralization Basins A & B. In Basins A & B the waste streams are mixed together and neutralized with either sulfuric acid or caustic (Sodium Hydroxide). These wastes are usually free of suspended solids.

SAND FILTERS – FLOW DESCRIPTION - From Basins A & B, the wastewater flows through a splitter box where it is evenly divided among three sand filters. Normally, only two filters will be in operation at the same time. The third sand filter is used as a backup unit. The clean filtrate exits from the sand bed, overflows a weir, and is discharged from the filter. The clarified effluent is then gravity fed to the effluent wetwell where final pH adjustments are made, if necessary, and the water is discharged into Sinclair Inlet via Outfall 021.

INDUSTRIAL DRAINS - These streams enter through the Diversion Manhole. They may contain oil and grease and suspended solids. Sources of these streams include: pure water room flush water, floor drain in lime storage silo building, diesel generator fuel oil room sump pump, diesel generator starting air dryer, pure water vacuum degasifier cooling water, lube oil building floor drains, utility tunnel sump pumps (from Bldg. 900 to the parking lot by the Farragut Ave. Gate), spray absorber buildings drains, and outbuilding drains and pumps in steam plant complex. It is possible for the following two streams to enter through the Diversion Manhole, but they are currently routed to the sanitary sewer: Diesel generator cooling tower blowdown and air compressor cooling tower blowdown.

INDUSTRIAL DRAINS - FLOW DESCRIPTION - The Oil & Grease are separated from the water in an Oil/Water Separator downstream of the Diversion Manhole. This unit is a gravity separator that utilizes the difference in specific gravity among the different non-mixable components in a liquid stream. Heavy solids settle out and the oil sludge rises to the surface. The remaining oily water mixture flows through a stack of closely spaced, corrugated polypropylene plates. Both the smaller oil droplets and fine solids are progressively separated as flow continues through the plates. The oil coalesces and rises in the form of large globules through the plate weep holes to the surface of the Separator. Oil skimmers then take the oil by gravity to a 50-gallon tank. Water that is separated from the oil is collected in the Oil/Water Separator Effluent Pumpwell. The effluent is then pumped back to the Primary Equalization Basin.

DRAINS MISCELLANEOUS AND FILTER BACKWASH - These streams enter the Equalization Basin manhole. The Equalization Basin manhole normally routes to the 25,000-gallon Primary Equalization Basin. The sources of wastewater streams that flow into the Primary Equalization Basin include the following: Industrial Drains, Pressure Filter Backwash, Oil/Water Separator Effluent Pumpwell, Parallel Plate Thickener Overflow, Emergency Equalization Basins A and B, Sludge Dewatering Filter Effluent, Bldg. 900 Floor Drains, Condensate Filter Backwash and Boiler Blowdown.

DRAINS MISCELLANEOUS AND FILTER BACKWASH - FLOW DESCRIPTION - The equalized influent pumps take suction on the Primary Basin and discharge to the flocculator, splitterbox, sand filters where the suspended solids are removed, and sent out to the system effluent wetwell.

Building 900 uses cooling towers for the emergency diesel generators and air compressor. Formerly, blowdown for these towers discharged into the Wastewater Treatment Plant, Building 912. This is no longer the case and the blowdown discharges into the sanitary sewer per the PSNS&IMF SWDP.

16.4 Regulatory Information

16.4.1 Current NPDES Permit limits and Compliance History

Table 16-1 summarizes permit limits in the current PSNS&IMF NPDES permits for the Steam Plant, Outfall 021, and relays the compliance history starting in 1994, the effective date of the current permit. Overall, no systemic compliance problems were observed. There were a number of somewhat isolated events that resulted in exceedances of permit limits.

A review of the events that resulted in the exceedances revealed that they were caused by mechanical failure of facility components. BNC has rectified this problem by providing more stringent operating instructions along with equipment and interlock checks. In other words, better quality assurance practices have been implemented.

Table 16-1: PSNS&IMF NPDES Steam Plant Permit Limits and Compliance Summary

Parameter	Currently Monitored	Unit	Monthly Average Limit	Daily Maximum Limit	Monitoring Frequency/Note	Compliance Position	Compliance Note
Flow	Yes	MGD	0.17	--	Continuous	Full Compliance	
Temperature	Yes	°F	70 (winter) 75 (summer)	90 (winter) 95 (summer)	Daily	Substantial Compliance	The monthly permit limit of 70° F was exceeded once in 2007.
Oil and Grease	Yes	mg/l lbs/day	10 14.18	15 21.28	Daily	Substantial Compliance	There were two exceedances of the maximum daily limit of 15 mg/l in 2006.
Total Suspended Solids	Yes	mg/l lbs/day	30 42.53	100 141	Three days a week	Substantial Compliance	There were two exceedances of the 100 mg/l limit in 2003.
Total Residual Chlorine	No	mg/l	--	0.20	Daily/Monitoring only required if chlorine is used which it is not.	NA	
Free Available Chlorine	No	mg/l	0.20	0.50	Daily/Monitoring only required if chlorine is used which it is not.	NA	
Chromium	No	mg/l	0.20	0.20	Weekly/Source: Air compressor and diesel generator cooling tower blowdown. No longer an NPDES discharge - discharges into the sanitary sewer.	NA	
Zinc	No	mg/l	1.0	1.0	Weekly/Source: Air compressor and diesel generator cooling tower blowdown. No longer an NPDES discharge - discharges into the sanitary sewer.	NA	
pH	Yes	S.U.	6.0 – 9.0	--	Daily	Substantial Compliance	There was one exceedances of the pH range of 6.0 to 9.0 in 2006. The pH was below the noted range.

16.4.2 Working Draft NPDES permit limits

Table 16-2 relays the Outfall 021 limits in the Working Draft Permit and predicts future compliance with the permit.

Table 16-2: Proposed Working Draft Permit Limits and Estimated Compliance Position

Parameter	Units	Monthly Average Limit	Daily Maximum Limit	Monitoring Frequency/Note	Estimated Compliance Position	Compliance Note
Flow	---		---	Continuous Recording	NA	
Temperature	°C	16	---	Continuous Recording	Regular Exceedances	The maximum daily permit limit is 16° C. Review of existing monitoring indicates that the limit would be exceeded the majority of the time.
Oil and Grease	mg/L lbs/day	15 10	10 7	Daily	No Exceedances	The final average monthly permit limit is 10 mg/l. The final maximum daily limit is 15 mg/l. These are same as current limits and no exceedances are anticipated.
TSS	mg/l lbs/day	100 68	30 21	Three per week	No Exceedances	The final average monthly permit limit is 30 mg/l. The final maximum daily limit is 100 mg/l. These are same as current limits and no exceedances are anticipated.
pH	s.u.	Between 7.0 and 8.5		Daily	Exceedances Unlikely	The pH range in the Working Draft Permit is 7.0 to 8.5 s.u. The current permit limits pH in the range of 6.0 to 9.0 s.u. While the limits in the Working Draft Permit are more restrictive than current no exceedances are anticipated.
Priority Pollutants				Annually	NA	

16.5 Planned Changes/Upgrades

16.5.1 Boiler Feedwater Using Reverse Osmosis

The general industry trend is now away from regenerative demineralizers, the current Steam Plant feedwater treatment system for boiler feedwater and toward the use of membrane filtration, such as reverse-osmosis (RO). RO is a separation process that uses pressure to force a solution through a semi-permeable membrane. The RO process results in two streams. (1) On the outlet side, high purity water is produced, suitable as boiler feedwater. (2) Reject water, which constitutes about 25% of the volume, has concentrated impurities. RO does not require the use of corrosive chemicals as does regenerative demineralizers.

BNC, along with an Architect/Engineering (A/E) firm is now in the design process to replace the existing regenerative demineralizers with RO to supply boiler feedwater. RO was selected as the boiler feedwater treatment option, in part since it minimizes the use of corrosive chemicals.

Switching to a RO system will affect Wastewater Treatment Plant operations. Eliminating the chemical regeneration will significantly change effluent processing.

16.6 Pollutants of Concern

Pollutants of concern, as outlined in Section 6.0, are not directly applicable to the Steam Plant. The Section 6.0 pollutants of concern were developed based on other shipyards and related permits and are not applicable to the Steam Plant. The primary reason the Steam Plant AKART analysis was completed is due the temperature limit in the Working Draft Permit (EPA 2008). As noted in Table 16-2, PSNS&IMF would likely exceed the proposed temperature limit.

While temperature is the main pollutant of concern, pH and TSS are also pollutants of concern. When the RO system is installed, the pH of the reject water may be higher than the source water (i.e., potable water). The levels could reasonable exceed the limits in the Working Draft Permit. While the TSS concentration in the RO reject water will be below the concentration limits in the Working Draft Permit the flow will increase. The increased flow will need to be carefully evaluated with relation to the TSS loading limits in the Working Draft Permit. This is further discussed and considered in Section 16.8.

16.7 Similar Facility Analysis

Facilities similar to the PSNS&IMF Steam Plant were evaluated to help determine how the current Building 912 treatment technology compares to the AKART standard. In other words, is it below, within, or above the AKART standard?

16.7.1 Seattle Steam

Seattle Steam operates three boilers, which are primarily fired using natural gas. Steam production varies with the season. Maximum steam production can exceed 400,000 pounds per hour during the winter.

The steam distribution system consists of 18 miles of underground pipelines. Condensate is not returned to the boiler plant and therefore Seattle Steam is classified as a 100% feedwater make-up operation, not too dissimilar to the PSNS&IMF Steam Plant.

The plant uses potable water supplied by the City of Seattle as boiler feedwater following treatment. Boiled feedwater is treated through a four-step process.

Potable water is first introduced into a sodium zeolite ion exchanger, which transfers calcium and magnesium hardness ions to the zeolite medium and releases non-scale forming sodium (Na) ions. When

the zeolite bed is exhausted, calcium and magnesium chlorides are backwashed to waste as the zeolite is regenerated with sodium chloride. This delivers softened cold water to the Deaerating (DA) Feedwater Heater.

The DA heater heats feedwater to 220° F to remove oxygen and other undissolved gases. Hot feedwater is then delivered to the feedwater supply system where treatment chemicals are added to further reduce the negative effects of hardness ions and to purge any trace of oxygen before entering the boilers.

The final step in the process is to add a filming amine to the generated steam to prevent corrosion in the steam condensate system.

The zeolite ion exchange backwash wastewater is discharged to Elliott Bay. This wastewater has not been heated. Elevated concentrations of sodium, calcium, magnesium, and chloride may be expected in the wastewater. Due to valve leakage, some untreated city water is also discharged. The continuous boiler blowdown wastewater was previously discharged directly to the Elliot Bay and this may have been responsible for pH exceedances. The blowdown was redirected to the Seattle Metro sanitary sewer in 1988.

16.7.2 Puget Sound Energy Whitehorn Generation Plant

Boiler feedwater is made using a demineralization process involving treating potable water by running it through a series of sand filters and demineralization beds.

Approximately 23,000 gpd of process wastewater is generated by backwashing the water treatment filters and demineralization system, and 500 gpd is generated from the floor drain. This wastewater is neutralized with sulfuric acid and caustic soda. Dissolved solids will be primarily sodium and sulfate ions due to the addition of sulfuric acid and sodium hydroxide for ion exchange regeneration.

After the treated filter, demineralizer backwash, and floor drain waters are neutralized, it is then pumped to the Strait of Georgia.

16.7.3 Portland General Electric Boardman Coal-Fired Power Plant

The PGE Boardman coal-fired generating facility is located in northeastern Oregon. This facility uses a demineralization process and a final resin polisher to generate boiler feedwater. During water processing, the resin beds must perform a regeneration cycle. All of the wastewater from the regeneration cycle, boiler blowdowns, and resin rinses go to a lined evaporation ponds.

16.7.4 Puget Sound Energy - Fredonia Generating Station

The Fredonia Generating Station is located 75 miles north of Seattle, or about 7 miles northwest of Mount Vernon in Skagit County, Washington.

PSE uses filtered and demineralized water to control nitrogen oxide formation during the combustion process in the combustion turbines. The demineralization process involves treating potable water by running it through carbon filters and demineralization beds. The facility uses sulfuric acid and sodium hydroxide to regenerate the cation and anion exchange resins in the water treatment process.

PSE discharges wastewater to the City of Burlington's sanitary sewer system. The wastewater consists of water treatment filter backwash, floor drains, and wastewater generated from the demineralization system. PSE neutralizes the combined wastewater with sulfuric acid and caustic soda prior to discharge to the sanitary sewer.

16.7.5 Similar Facility Summary

Table 16-3 summarizes the similar facility investigation.

Table 16-3: Similar Facility Summary

Facility	Primary Feedwater Treatment Method	Primary Wastewater Treatment	Discharge Location
PSNS&IMF	Demineralization	Filtration	Surface Water and Sanitary Sewer[18]
Seattle Steam	Ion Exchange (Softening)	None	Surface Water and Sanitary Sewer[19]
PSE Whitehorn	Demineralization	Filtration	Surface Water
PGE Boardman	Demineralization	Evaporation Pond	NA
PSE Fredonia	Demineralization	Neutralization	Sanitary Sewer

16.7.6 Similar Facility AKART Determination

There are two common options for disposing/treating steam plant wastewater. The primary treatment methods include neutralization and/or filtration. Oil/water separation is also conducted. Seattle Steam's use of ion exchange method of generating feed water is not an option for PSNS&IMF since a portion of the demineralization/de-ionized water is used for distribution throughout the Shipyard.

Sending the wastewater to an evaporation pond is not a viable option for PSNS&IMF due to the land space requirements and local climatic conditions.

Discharge of treated effluent to either surface water or the sanitary sewer meets the AKART Standard. It is not atypical to have a split approach, a portion to surface water and a portion to the sanitary sewer.

From a similar facility approach, the current PSNS&IMF method of wastewater treatment, (regenerative demineralization process), and associated discharge approach is substantially similar to other facilities. The PSNS&IMF method of boiler feed water treatment is equivalent to other facilities. Overall PSNS&IMF's current method of boiler feed water and wastewater treatment is within the AKART range (achieves the AKART standard). The relatively good history of compliance with existing NPDES permit reinforces the AKART determination.

16.8 AKART Analysis of Proposed RO Feed water Treatment

The Similar Facility evaluation did not reveal other facilities using RO for boiler feed water treatment. Generally, RO is a higher level of "treatment" and therefore is above the AKART range. In addition, RO eliminates the need for hazardous treatment chemicals. The switch, however, results in a number of treatment options or opportunities identified and discussed in Table 16-4. Table 16-4 also tentatively selects the most viable option. The option is only tentative as regulatory approval will be required, and funding, if needed, must be obtained.

[18] Air compressor and Emergency Diesel Generator cooling towers blowdown into the sanitary sewer. All Demineralization regeneration water discharges into Sinclair Inlet after treatment.
[19] Softener backwash is discharged into Elliot Bay.

Table 16-4: Similar Facility Summary

Source	Discharge Location	Discussion	Selected Option
RO Reject Water	Surface Water	The reject water from the RO units will contain approximately four times the dissolved and suspended solids of the potable water input. Estimated TSS concentration would be less than 12 mg/l, which is below the Working Draft Permit Limit. RO reject water is essentially concentrated potable water with elevated TSS levels. Overall, volumes will likely increase after switching to RO. TSS loading limits will need to be carefully considered as it may be difficult to meet the TSS loading limit in the Working Draft Permit. The pH of the RO reject water will also need to be carefully considered. For example, average pH of Bremerton's potable water is 7.7. RO concentrates bicarbonate in the reject water. The higher the concentration of bicarbonate leads to an increase in pH. Based on a phone call to the Siemens Company (a supplier of RO units): The pH of the reject water will be roughly 1 unit higher than the potable inlet water. Therefore, the predicted inlet pH of the reject water is 8.7. This amount is close to the current limit of 9 but is over the Working Draft Permit limit of 8.5. To help clarify this question, the A/E firm that is designing the upgrade has been presented with the pH question. Currently, some of the design will be rectified pending an answer from the A/E firm. Even considering these two potential issues discharge to surface water is the selected discharge option considering the source; potable water. The pH and TSS issues, if in fact they turn out to be issues, could reasonably be resolved.	Yes
RO Reject Water	Sanitary Sewer	Since the reject water starts as potable water, discharge into the sanitary sewer may not be a viable option as it is prohibited to discharging clean water into the sanitary sewer. This is not a viable option.	No
Boiler Blowdown	Surface Water	This is the current disposition method following treatment at Building 912. The characteristics of the wastestream will be the same pre/post RO. Boiler blowdown is heated and compliance with the temperature limit in the Working Draft Permit is a concern. For this reason discharge to surface water is not a good option.	No
Boiler Blowdown	Sanitary Sewer	Discharging this wastestream into the sanitary sewer would eliminate the source of heated water (to surface water) resulting in an improved compliance posture with the Working Draft Permit temperature limit. PSNS&IMF would need to add the wastestream to the SWDP prior to discharge into the sanitary sewer. This is a reasonable AKART option.	Yes

Table 16-4: Similar Facility Summary

Source	Discharge Location	Discussion	Selected Option
Industrial Drains and Carbon Filter backwash	Surface Water	This is the existing discharge method. The wastestream from the industrial drains can be quite variable. Compliance with the Working Draft Permit limits are expected. This is a viable option.	No
Industrial Drains and Carbon Filter backwash	Sanitary Sewer	Discharge into the sanitary sewer is also a viable option. The existing oil/water separation system could pre-treat the wastestreams prior to discharge into the sanitary sewer. PSNS&IMF would need to add the wastestream to the SWDP. This option would achieve the AKART standard and is a reasonable AKART option. Overall, it is a better option than discharge to surface water.	Yes

The AKART analysis revealed that a reasonable option for RO reject water is discharge through Outfall 021. For other Steam Plant wastewaters discharge into the sanitary sewer was determined the best overall option. A new discharge pipe will need to be installed in order to route the wastestreams into the sanitary sewer. This will be part of the RO project, an estimated construction cost of 2.22 million dollars, which is planned to start in the summer of 2009.

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Attachment 1: NPDES Permit

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study
National Pollutant Discharge Elimination System Permit

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IV. GENERAL REQUIREMENT

I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Specific Limitations and Monitoring Requirements.

1. During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge drydock drainage and noncontact cooling water from outfalls 018 (including 018A and 096) and 019, treated steam plant wastewater from outfall 021, and stormwater runoff, demineralized water, steam condensate, salt water supply system, and potable water from the remaining outfalls.

a. Such discharges shall be limited and monitored by the permittee as specified below:

OUTFALL NUMBER	EFFLUENT CHARACTERISTIC	UNIT OF MEASUREMENT	DISCHARGE LIMITATIONS Monthly Average	Daily Maximum	MONITORING REQUIREMENT Sampling Frequency	Sampling Type
018,018A And 096	Flow	MGD	----------	----------	Weekly	Estimate
	Oil and Grease	mg/l	10	15	Weekly	Grab
	Copper (Total Recoverable)	mg/l lbs/day 4/	0.019 0.44	0.033 0.77	Weekly	Grab
	Lead, Mercury, Zinc Copper (Total Recoverable)	mg/l	----------	----------	Monthly 1/	24 hr composite
	Temperature	•F	----------	----------	Monthly	Grab
	PCB's	mg/l	----------	----------	Monthly 1 /	Grab
	Whole Effluent Toxicity Testing	----------	----------	----------	per Part I. D.	
019	Flow	MGD	----------	----------	Weekly	Estimate
	Oil and Grease	mg/l	10	15	Weekly	Grab
	Copper (Total Recoverable)	mg/l lbs / day	0.019 0.83	0.033 1.44	Weekly	Grab

OUTFALL NUMBER	EFFLUENT CHARACTERISTIC	UNIT OF MEASUREMENT	DISCHARGE LIMITATIONS Monthly Average	Daily Maximum	MONITORING REQUIREMENT Sampling Frequency	Sampling Type
	Lead, Mercury, Zinc, Copper (Total Recoverable)	mg/l	----------	----------	Monthly	24 hr composite
	Temperature	•F	----------	----------	Monthly	Grab
	PCBs	mg/l	----------	----------	Monthly 1 /	Grab
	Whole Effluent Toxicity Testing	----------	----------	----------	per Part I.D.	
021	Flow	MGD	0.17	----------	Continuous	Recorded
	Temperature	°F	70 (winter) 75 (summer)	90 (winter) 95 (summer)	Daily	Grab
	Oil and Grease	mg/l lbs/day	10 14.18	15 21.28	Daily	Grab
	TSS	mg/l lbs/day	30 42.53	100 141	3/7 days	24 hr composite
	Total Residual Chlorine	mg/l	----------	0.20	Daily 2 /	Grab
	Free Available Chlorine	mg/l	0.20	0.50	Daily 2 /	Grab
	Chromium 3 / (Total Recoverable)	mg/l	0.20	0.20	Weekly	Grab
	Zinc 3 / Total Recoverable	mg/l	1.0	1.0	Weekly	Grab
	PH	S.U.	(1)	----------	Daily	Grab

(1) pH shall not be less than 6.0 standard units not greater than 9.0 standard units and shall be monitored continuously and recorded. The total time, which pH values are outside the range of 6.0 to 9.0, shall not exceed one percent of the operating time each month. The permittee shall report on the DMR the maximum and minimum pH, and for any excursions above or below the limit, the total number of minutes per moth of excursion and the number of excursions exceeding 60 minutes.

(2) Whole effluent toxicity testing required in part I.C. for discharges 018 and 019 shall be conducted on discharge samples collected concurrent with chemical specific monitoring required under part I.A. Toxicity testing protocols and reporting requirements are established in section I.C. below.

1/ Monitoring shall be conducted for one year (12 monthly samples). Additional monitoring or effluent limitations may be proposed by permit modification, if the monitoring results indicate any reasonable potential that water quality standards may be exceeded in receiving waters.

2/ Monitoring for these parameters is required only in the event that use of chlorine is resumed. The permittee shall indicate on the DMR form "no discharge" for these pollutant parameters except when monitoring and/or chlorine usage actually occurs.

3/ Limitations and monitoring requirements for these parameters apply to the wastewater flow from the air compressor cooling tower blowdown and diesel generator cooling tower blowdown before it is commingled with other waste streams.

4/ Load limitations for copper applicable to the cumulative discharges from outfalls 018, 018A and 096:

b. There shall be no discharge of floating solids, visible foam in other than trace amounts, or oily wastes which produce a sheen on the surface of the receiving water.

c. Discharges are not authorized to cause a violation of State Water Quality Standards, as defined in Chapter 173-210A WAC, outside the boundaries of the mixing zones established as described below:

For outfall 021, the boundaries of the mixing zone where the discharge shall not cause an exceedance of water quality standard for temperature and marine chronic effects is 150 feet in any horizontal direction from the diffuser.

Water quality standards for acute effects shall be met within 24 feet in any horizontal distance from the outfall. Mixing zones shall extend from the surface to the bottom of the receiving water.

For outfalls 018 (including 018A and 096) and 019, the boundaries of the mixing zone where the discharge shall not cause an exceedance of water quality standards for temperature and marine chronic effects is 200 feet in any horizontal direction from the discharge. Water quality standards for acute effects shall be met within 20 feet in any horizontal distance from the outfall. Mixing zones shall extend from the surface to the bottom of the receiving water.

Mixing zones for discharges or stormwater runoff from other shipyard outfalls are not established in this permit. EPA anticipates that implementation of best management practices and stormwater pollution prevention plan, as required in this permit, will minimize the potential for water quality impacts from these discharges.

d. There shall be no discharge of polychlorinated biphenyl (PCB) compounds.

e. For the purposes of reporting, the Permittee shall use the lowest calibration or the CRDL (as defined below). The permittee must conduct analyses in accordance with the analytical method specified below or use other equally sensitive EPA approved (per part 40 CFR 136) methods. A standard must be used which is equivalent to the quantification level specified below:

Parameter	Analytical Method	CRDL and Lowest Calibration Concentration
Arsenic	206.2	10 ug/l
Cadmium	213.2	1 ug/l
Chromium	200.7	10 ug/l
Copper	220.2	10 ug/l
Cyanide	335.2	10 ug/l
Lead	239.2	5 ug/l
Mercury	245.1	0.2 ug/l
Nickel	249.2	5 ug/l
PCB	608	1.0 ug/l
Zinc	200.7	20 ug/l

For the purpose of reporting on the discharge monitoring report, all analytical values below the quantification level may be reported equal to 0. All analytical values at or above the quantification level shall be reported as the measured value.

The permittee shall report in the Comment Section on the discharge monitoring report the lowest calibration standard used, the number of results that were found to be below the quantification level, and the quantified level achieved.

f. Discharges from the permittee's salt water supply system shall not contain biocides in concentrations, which may cause exceedance of state water quality standards.

g. Vessel bilge and ballast waters shall be treated to remove oil and grease in accordance with approved shipyard operating instructions (No. 0593-903 or as amended).

h. Storage piles of salt used for de-icing or other commercial or industrial purposes shall be enclosed or covered to prevent exposure to precipitation, except for exposure resulting from adding or removing materials from the pile. Dischargers shall demonstrate compliance with this provision as expeditiously as practicable, but in no event later than three years after the date of issuance of this permit. Piles do not need to be enclosed or covered where storm water from the pile is not discharged to waters of the United States.

i. Any discharge composed of coal pile runoff shall not exceed a maximum concentration for any time of 50 mg/l total suspended solids. Coal pile runoff shall not be diluted with storm water or other flows in order to meet this limitation. The pH of such discharges shall be within the range of 6.0-9.0. (Note: the coal storage area at PSNS is enclosed in a large building. Storm water runoff from the area surrounding the coal storage building is anticipated to discharge vial outfall 022).

B. Compliance Schedule and Interim Limitations

1. During the period beginning on the effective date and lasting until December 31, 1996, the following interim limitations shall apply to discharges from outfalls 018 (including 018A and 096) and 019.

	Units of Measurement	Monthly Average	Monthly Maximum	Daily
Copper (total recoverable) 1/	mg/l	0.045		0.070

1/ Monitoring and reporting requirements are not changed from permit part I.A.1.a. If EPA determines that cause for modification exists pursuant to 40 CFR 122.62, this section of the permit may be reopened and modified to accommodate such cause.

C. Ambient Monitoring

Ambient receiving water monitoring for total recoverable and dissolved copper, lead and zinc shall be conducted quarterly during the first year of this permit. Each sampling event will consist of three samples collected at different tidal conditions (incoming, outgoing and low slack). The monitoring location shall be approximately mid-way across Sinclair Inlet in a southerly direction from drydock 6. The latitude and longitude coordinates of this sampling station shall be established prior to or during the first sampling event to allow relocation for future sampling. Station coordinates shall be reported with the monitoring data.

Samples shall be collected according to Recommended Sampling Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples (Dec. 1989). The depth of water from which samples are collected shall be consistent throughout this period of sampling.

D. Whole Effluent Toxicity Testing

The permittee shall conduct monitoring to determine the acute and chronic toxicity of discharges from outfalls 018 and 019. Toxicity testing shall be conducted on 24-hour composite samples collected quarterly during the first year of this permit. Samples for toxicity testing shall be collected concurrently with samples collected for chemical analyses (as required under part 1.A., above). Testing shall be accomplished according to reporting and monitoring protocols identified below.

1. Acute Tests

The Permittee shall conduct acute toxicity testing in accordance with the following paragraphs a-e, and section 3.a-g, below.

a. The Permittee shall conduct 96-hour static renewal or flow-through tests for estimating toxicity of the effluent using one of the following organisms:

(1) Silverside Minnow (Menidia beryllina)
(2) Mysid Shrimp (Mysidopsis bahia)

The Permittee shall conduct testing according to the guidelines set forth in Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (Fourth Edition), EPA/600/4-90/027.

c. The toxicity testing shall include a series of six test solutions, ranging from zero percent effluent (control) to 100 percent effluent. No additional testing at other dilutions is required if the NOEC is determined to be 100 percent effluent. Adjustments to salinity may be used, if necessary, to minimize effects of low salinity on marine test organisms. Salinity adjustment may be made according to current recommended procedures using sea salts or receiving water. Based on available data, dilutions shall be selected that will bracket the expected LC_{50} (see definitions) of the effluent. Test results shall be reported in acute toxic units (TU_A, see definitions). In addition, the Permittee shall report the LC_{50} of the effluent in control water, as well as the 95 percent confidence limits of the LC_{50}, calculated using an internally consistent scheme based on the moving average angle, graphical, or probit method, as appropriate.

d. In conducting acute tests, the Permittee shall also report responses that could reasonably be expected to result in ecological death (e.g., cessation of swimming behavior) and, if possible, the Permittee shall determine a 96-hour EC_{50}.

e. All reporting, quality assurance criteria and statistical analyses used for acute tests shall be in accordance with Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine

Organisms (Fourth Edition), EPA/600/4-90/027. The report of acute test results shall include all relevant information outlined in Section 12 of the above document.

2. Chronic Tests

The Permittee shall conduct chronic toxicity testing in accordance with the following paragraphs a-e and section 3.a-g, below.

a. The permittee shall conduct chronic toxicity testing using one of the following organisms:

(1) Sand dollar (Dendraster excentricus)
(2) Green, purple or red sea urchin (Strongylocentrotus droehbachiensis, Strongylocentrotus purpuratus, Strongylocentrotus franciscanus, respectively)
(3) Pacific oyster (Crassostrea gigas)
(4) Bay mussel (Mytilus edulis)

Species shall be selected based on availability of organisms in spawning condition.

b. All test organisms and procedures for the bivalve larvae tests shall be in accordance with:
Standard Practice for Conducting Static Acute Toxicity Tests with the Larvae of Four Species of Bivalve Molluscs, designation: E 724-89. ASTM. 1989.

All test organisms and procedures for the echinoderm tests shall be in accordance with:

(i) Improved Methodology for a Sea Urchin Sperm Cell Bioassy for Marine Waters. Dinnel, P.A., J. M. Lind, and Q. J. Stober. 1987. arch. Environ. Contam. Toxicol. 16:23-32; or

(ii) Methodology and Validation of a Sperm Cell Toxicity Test for Testing Toxic Substances in Marine Waters., Dinnel, et al., FR- UW-8306, November 1983; and

EPA Region 10 Guidance for Conducting Effluent Toxicity Tests Using West Coast Sea Urchins and Sand Dollars.

c. The toxicity testing shall include a series of six test solutions, ranging from zero percent effluent (control) to 100 percent effluent. No additional testing at other dilutions is required if the NOEC is determined to be 100 percent effluent. Adjustments to salinity may be used, if necessary, to minimize effects of low salinity on marine test organisms. Salinity adjustment may be made according to current recommended procedures using sea salts or receiving water. Based on available data, dilutions shall be selected that will bracket the expected no observable effects concentration (NOEC, see definitions) of the effluent. In addition, one dilution will be used that corresponds with the dilution necessary to show compliance with the permit limit. Salinity adjustment shall be used, if appropriate. For

compliance purposes, test results shall be reported in chronic toxic units (TU_C, see definitions).

d. In addition to reporting TU_C, the Permittee shall report the NOEC and the EC_{50} (see definitions) of the effluent in control water.

e. All reporting, quality assurance criteria and statistical analyses used for chronic tests shall be in accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms EPA/600/4-87/028 and individual test protocols. The report of results shall include all relevant information outlined in Section 10, Report Preparation of this EPA document.

3. Both Types of Toxicity Tests

Paragraphs a-g, below apply to all toxicity tests described in sections 1 and 2 of this part of the permit.

a. Testing shall be conducted on 24-hour composite samples of effluent. Each sample collected shall be large enough to provide enough effluent to conduct the toxicity tests, as well as required chemical testing.

b. To the extent possible, the Permittee shall conduct acute and chronic testing on split samples of effluent.

c. Dilution water for marine tests shall be high quality natural seawater. Artificial sea salts or concentrated brine may be used if the lab can achieve reliable results when conducting the specified test with the chosen medium.

d. Any tests that fail the criteria for control response as specified in the respective protocols shall be repeated on a freshly collected sample.

e. The Permittee shall submit the results of the toxicity tests in TUs within 60 days of the sampling event. Sampling information shall be mailed to same address to which monthly DMRs are sent. Along with the results, the Permittee shall include: (1) the dates of sample collection and initiation of each toxicity test; (2) general activities within the drydocks and weather conditions at the time of sampling; and (3) the flow rate (whether measured or estimated) at the time of sample collection.

f. If EPA determines that any of the toxicity tests are inadequate for evaluating the Permittee's effluent, EPA may substitute alternative tests that will provide the required toxicity information.

Sediment Monitoring

The permittee shall submit to EPA, Region 10, Water Division results of future sediment monitoring conducted as required by Washington Department of Ecology, Toxic Cleanup Program and EPA's Superfund Program. Sediment monitoring information available from each preceding calendar year shall be submitted by May 15, annually.

Monitoring conducted to date and additional monitoring proposed for the future are anticipated to adequately address sediment quality concerns during the five year life of this permit. However, this permit may be reopened and modified to established effluent limitations and/or monitoring requirements if determined necessary to protect water or sediment quality from being degraded by discharges from the shipyard.

E. Stormwater Monitoring

Stormwater discharges from outfalls 002, 003, 006, 010, 013, 014, 028, 022, 025, 030, 040 and 052 (052 was formerly designated 007b) shall be monitored according to the following requirements:

1. Sample analyses of stormwater discharges listed below shall be conducted for the following pollutants:

Outfalls	Conventional Pollutants 1/	Metals 2/	Total Petroleum Hydrocarbons 3/	Cyanide	Semi-Volatile Organics 4/
002, 012, 014, 025 and 040	X	X	X		
010 and 030		X		X	
003, 006, 013, 028 and 052	X	X	X		X
022	X		X		

2. Permittee shall collect "grab" samples of the discharges. As logistics allow, the permittee shall attempt to collect samples within the first 30 minutes of storm event.

3. Samples shall be collected at each of the identified outfalls for two years according to the following sampling schedule:

a. During or immediately after a significant rainfall event 5/ after September 1, and;
b. During or immediately after a significant rainfall event, after March 1 and before April 30, and;
c. During the month of August when no measurable precipitation has occurred within 48 hours.

4. Sampling results shall be submitted within 60 days of sample collection. Outfalls not discharging during the specified sampling periods shall be identified accordingly in the sampling report.

5. This permit may be modified to require additional monitoring or to establish effluent limitations based upon the information determined from the stormwater sampling.

6. The permittee may discontinue stormwater monitoring at individual outfalls for any parameter, which has been determined to be nondetectable (at CRDLs) after the first three sampling events.

7. For each sampling event, the permittee shall provide the following information: The flow measurements or estimates of the flow rate, and the total amount of discharge for the storm event sampled, and the method of flow measurement or estimation. The date and duration (in hours) of the storm event (in inches) which generated the sample runoff and the duration between the storm event sampled and the end of the previous measurable storm event.

1/ Conventional pollutants, for purposes of stormwater monitoring, shall include the five day biochemical oxygen demand (BOD^5), total suspended solids (TSS), chemical oxygen demand and pH.

2/ Metals, for purposes of stormwater monitoring, shall include arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. Metal analyses (including cyanide) shall determine total recoverable concentration at CRDLs (see definitions).

3/ Total petroleum hydrocarbons (TPH) shall be determined using EPA method 600/4-79-020. The permittee shall conduct additional analyses on any sample, which exceeds 10 mg/1 using Washington Department of Ecology method WTPH 418.1 modified. Result of this analyses shall be submitted with the TPH data.

4/ Semi-volatile organics are those substances listed under 40 CFR 122 Appendix D Table II, Acid Compounds, Base/Neutral and Pesticides.

5/ A significant rainfall event (storm) if defined for this permit as:
1) depth of storm equals 0.1 inch of rain or greater
2) storm should be proceeded by 72 hours of dry weather, and
3) the variance in the duration of the event and the total rainfall of the event should not exceed 50% from the average of the area's median rainfall event.

F. Definitions

1. Acute Toxic Unit (TU_A) is a measure of acute toxicity. The number of acute toxic units in the effluent is calculated as $100/LC_{50}$ where the LC_{50} is measured in percent effluent.

2. Administrator means the Administrator of the USEPA, or an authorized representative.

3. Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

4. Chronic Toxic Unit (TU_C) is a measure of chronic toxicity. The number of chronic toxic units in the effluent is calculated as 100/NOEC where the NOEC is measured in percent of effluent.

5. Daily discharge means the discharge of a pollutant during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in concentration, rates, or other units, the daily discharge is the average measurement of the pollutant over the day.

6. Daily maximum. See Maximum daily discharge.

7. EC_{50} is a point estimate of the effluent concentration that would cause an observable adverse effect (such as death, immobilization, or serious incapacitation) in 50 percent of the test organisms exposed.

8. Final effluent means effluent at, or upstream from the point where a permitted outfall enters navigable waters, and through which all waste streams pass that are discharged from the outfall.

9. Grab sample is a single sample or measurement taken at a specific time or over as short a period of time as is feasible. See Part III.F. (Representative Sampling)

10. LC_{50} means concentration of effluent that is acutely toxic to 50 percent of the test organisms exposed.

11. Maximum daily discharge limitation or daily maximum means the highest allowable daily discharge.

12. Monthly average discharge means the average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

13. NOEC means no observable effect concentration. The NOEC is the highest tested concentration of an effluent at which no adverse effects are observed on the test organisms at a specific time of observation.

14. Regional Administrator means the EPA Region 10 Regional Administrator, or an authorized representative.

15. Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

16. 24-hour composite sample shall mean a flow-proportioned mixture of not less than 8 discrete aliquots. Each aliquot shall be a grab

sample of not less than 100 ml and shall be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for the Examination of Water and Wastewater.

17. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

18. Waste stream means any non-deminimus source of pollutants within the Permittee's facility that enters any permitted outfall or navigable waters. This includes spills and other unintentional, non-routine or unanticipated discharges.

19. Contract Required Detection Levels (CRDLs) means the analytical level of detection EPA contract laboratories are required to attain and are considered the lowest level for quantitative decisions based upon individual sample measurements. Required detection levels and associated analytical methodologies for metals are identified in permit Part 1.A.e.

20. Significant materials include but are not limited to: raw materials; fuels; materials such as solvents; detergents and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous materials designated under section 101 (14) of CERCLA; any chemical at or above threshold levels pursuant to EPCRA which have the potential to be released with stormwater.

21. Significant spills (applicable to the stormwater requirements of this permit) includes, but is not limited to releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (see 40 CFR 110.10 and 40 CFR 117.21) or section 102 of CERCLA (see 40 CFR 302.4).

22. Section 313 water priority chemical means a chemical or chemical categories which: 1) are listed at 40 CFR 372.65 pursuant to section 313 of the Emergency Planning and Community Right to Know Act (EPCRA); 2) Are present at a facility, at or above the following threshold amounts: (i) 25,000 pounds of the chemical processed or manufactured for the year, (ii) 10,000 pounds of the chemical otherwise used at a facility for the applicable year; 3) that meet one of the following criteria (i) are listed in Appendix D of 40 CFR 122 on either table II, Table III, or Table IV; (ii) are listed as a hazardous substance pursuant to section 311 (b) (2) (A) of the CWA at 40 CFR 116.4; or (iii) are pollutants for which EPA has published acute or chronic water quality criteria. A list of 313 water priority chemicals are attached to the fact sheet for this permit.

II. BEST MANAGEMENT PRACTICES (BMPs)

A. Purpose

The permittee shall during the term of this permit operate the facility in accordance with BMPs , which prevents or minimizes the generation of pollutants, their release, and potential release into waters of the United States though normal operation and ancillary activities.

The permittee, shall develop and implement a Best Management Practices (BMP) Plan, which achieves the objectives and the specific requirements listed below. A copy of the Plan shall be submitted to EPA for review within three months of the effective date of the permit. EPA shall have the right to disapprove the BMP Plan within 60 days of receipt, after which the Plan shall be deemed approved, unless EPA disapproves of the submittal. The Plan shall be implemented as soon as possible but no later than twelve months from the effective date of the permit.

The permittee shall ensure that BMPs developed specifically for PSNS activities that are similar to commercial shipyard operations are equivalent (in terms of environmental protection) to BMPs developed by Washington Department of Ecology for commercial shipyard operations and identified as Best Management Practices for Drydock, Vessel, and Yard Operations and Maintenance.

B. Objectives

The permittee shall develop (or amend existing) BMPs to be consistent with the following objectives for the control of pollutants.

1. The number and quantity of pollutants and the toxicity of effluent generated, discharged or potentially discharged at the facility minimized by the permittee to the extent feasible by managing each waste stream in the most appropriate manner.

2. Under the BMP Plan, and any SOPs included in the Plan, the permittee shall ensure proper operation and maintenance of any treatment facility.

3. The permittee shall establish specific objectives for the control of pollutants by conducting the following evaluations:

    a. Each facility component or system shall be examined for its waste minimization opportunities and its potential for causing a release of significant amounts of pollutants to waters of the United States due to equipment failure, improper operation, natural phenomena such as rainfall or snowfall, etc. The examination shall include all normal operations and ancillary activities including material storage and handling areas, plant site runoff (see condition), loading or unloading operations, and spillage or leaks.

    b. Where experience indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances to result in significant amounts of pollutants reaching surface waters, the program should include a prediction of the direction, rate of flow and

total quantity of pollutants which could be discharged from the facility as a result of each condition or circumstance.

C. Requirements.

The BMP Plan shall be consistent with the objectives in Part B above and the general guidance contained in the publication entitled "Best Management Practices Guidance Document" (U.S. EPA, 1981) or any subsequent revisions to the guidance document. The BMP Plan shall:

1. Be documented in narrative form, and shall include any necessary plot plans, drawings or maps, and shall be developed in accordance with good engineering practices. The BMP Plan shall be organized and written with the following structure:

a. Name and location of facility.

b. Statement of BMP policy.

c. Structure, functions, and procedures of the Best Management Practices Committee.

d. Specific management practices and standard operating procedures to achieve the above objectives, including, but not limited to, the following:

(1) modification of equipment, facilities, technology, processes, and procedures,
(2) reformulation or redesign of products,
(3) substitution of materials, and
(4) improvement in management, inventory control, materials handling or general operational phases of the facility.

f. Risk identification and assessment.

g. Reporting of BMP incidents.

h. Materials compatibility.

i. Good housekeeping.

j. Preventive maintenance.

k. Inspections and records.

l. Security.

m. Employee training.

2. Include the following provisions concerning BMP Plan review:

   a. Be reviewed by appropriate staff and the Shipyard Commander.

   b. Be reviewed and endorsed by the permittee's BMP Committee.

   c. Include a statement that the above reviews have been completed and that the BMP Plan fulfills the requirements set forth in this permit. The statement shall be certified by the dated signatures of each BMP Committee member.

3. Establish specific best management practices to meet the objectives identified in Part II.B.3 of this permit, addressing each component or system capable of generating or causing a release of significant amounts of pollutants, and identifying specific preventative or remedial measures to be implemented.

4. Establish specific best management practices or other measures which ensure that the following specific requirements are met:

   a. Ensure proper management of solid and hazardous waste in accordance with regulations promulgated under the Resource Conservation Recovery Act (RCRA). Management practices required under RCRA regulations shall be referenced in the BMP Plan.

   b. Reflect requirements for Spill Prevention, Control, and Countermeasure (SPCC) plans under Section 311 of the Act and 40 CFR Part 112, and may incorporate any part of such plans into the BMP Plan by reference.

   c. Reflect requirements for storm water control under Section 402(p) of the Act and the regulations at 40 CFR 122.26 and 122.44, and otherwise eliminate to the extent practicable, contamination of storm water runoff.

D. Documentation.

The permittee shall maintain a copy of BMP Plan at the facility and shall make these documents available to EPA upon request. All offices of the permittee which are required to maintain a copy of the NPDES permit shall also maintain a copy of the BMP Plan.

E. BMP Plan Modification.

The permittee shall amend the BMP Plan whenever there is a change in the facility or in the operation of the facility, which materially increases the generation of pollutants or their release or potential release to the receiving waters. The permittee shall also amend the Plan, as appropriate, when plant operations covered by the BMP plan change. Any such changes to the BMP Plan shall be consistent with the objectives and specific requirements listed above. All changes in the BMP Plan shall be reviewed by the plant engineering staff and facility supervisor and shall be reported to EPA in writing. Such changes are deemed

approved if EPA submits no comments or objections to the permittee within 60 days of receipt of the revised BMP Plan.

F. Modification for Ineffectiveness.

At any time, if the BMP Plan proves to be ineffective in achieving the general objective of preventing and minimizing the generation of pollutants and their release and potential release to the receiving waters and/or the specific requirements above, the permit and/or the BMP Plan shall be subject to modification to incorporate revised BMP requirements.

III. STORM WATER POLLUTION PREVENTION PLANS

A storm water pollution prevention plan shall be developed for the entire facility covered by this permit. Storm water pollution prevention plans shall be prepared in accordance with good engineering practices. The plan shall identify potential sources of pollution, which may reasonably be expected to affect the quality of storm water discharges associated with industrial activity from the facility. In addition, the plan shall describe and ensure the implementation of practices, which are to be used to reduce the pollutants in storm water discharges, associated with industrial activity at the facility and to assure compliance with the terms and conditions of this permit. Facilities must implement the provisions of the storm water pollution prevention plan required under this part as a condition of this permit. Coverage of this facility under any general or group permit issued for stormwater discharges shall be terminated upon issuance of this permit.

A. Deadlines for Plan Preparation and Compliance.

The plan for a storm water discharge associated with industrial activity shall be prepared and shall provide for implementation and compliance with the terms of the plan within twelve months of permit issuance. The plan shall contain a schedule for completion of stormwater related construction activities, which extend beyond this implementation period.

B. Signature and Plan Review.

1. The plan shall be signed and be retained on-site as part of the Puget Sound Naval Shipyard BMP Plan.

2. The permittee shall make plans available upon request to the Director, or authorized representative.

3. The Director, or authorized representative, may notify the permittee at any time that the plan does not meet one or more of the minimum requirements of this Part. Within 30 days of such notification from the Director, (or as otherwise provided by the Director), or authorized representative, the permittee shall make the required changes to the plan and shall submit to the Director a written certification that the requested changes have been made. The permittee may request additional time to

comply with such requests from the Director if circumstances are present which present a significant obstacle to compliance within the designated time frame.

C. Keeping Plans Current.

The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to the waters of the United States or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified under Part III.D.2 (description of potential pollutant sources) of this permit, or in otherwise achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Amendments to the plan may be reviewed by EPA in the same manner as Part III.B (above).

D. Contents of Plan.

The plan shall include, at a minimum, the following items:

1. Pollution Prevention Team.

The plan shall identify positions within the facility organization as members of a storm water Pollution Prevention Team that are responsible for developing the storm water pollution prevention plan and assisting facility supervisors in its implementation, maintenance, and revision. The plan shall clearly identify the responsibilities of each team member. The activities and responsibilities of the team shall address all aspects of the facility's storm water pollution prevention plan.

2. Description of Potential Pollutant Sources.

Each plan shall provide a description of potential sources which may reasonably be expected to add significant amounts of pollutants to storm water discharges or which may result in the discharge of pollutants during dry weather from separate storm sewers draining the facility. Each plan shall identify all activities and significant materials, which may potentially be significant pollutant sources. Each plan shall include, at a minimum:

a. Drainage.

(1) A site map indicating an outline of the portions of the drainage area of each storm water outfall that are within the facility boundaries, each existing structural control measure to reduce pollutants in storm water runoff, surface water bodies, locations where significant materials are exposed to precipitation, locations where major spills or leads identified under Part III.D.2.c (spills and leaks) of this permit have occurred, and the activities are exposed to precipitation: fueling stations, vehicle and equipment maintenance and/or cleaning areas, loading/unloading areas, locations used for the treatment, storage or disposal of wastes, liquid storage tanks, processing areas and storage areas.

(2) For each area of the facility that generates storm water discharges associated with the industrial activity with a reasonable potential for containing significant amount of pollutants, a prediction of the direction of flow, and an identification of the types of pollutants, which are likely to be present in storm water discharges, associated with industrial activity. Factors to consider include the toxicity of chemical; quantity of chemicals used, produced or discharged; the likelihood of contact with storm water; and history of significant leaks or spills of toxic or hazardous pollutants. Flows with a significant potential for causing erosion shall be identified.

b. Inventory of Exposed Materials.

An inventory of the types of materials handled at the site that potentially may be exposed to precipitation. Such inventory shall include a narrative description of significant materials that have been handled, treated, stored or disposed in a manner to allow exposure to storm water between the time of three years prior to the date of the issuance of this permit and the present; method and location of the on-site storage or disposal; materials management practices employed to minimize contact of materials with storm water runoff between the time of three years prior to the date of the issuance of this permit and the present; the location and a description of existing structural and non-structural control measures to reduce pollutants in storm water runoff; and a description of any treatment the storm water receives.

c. Spills and Leaks.

A list of significant spills and significant leaks of toxic or hazardous pollutants that occurred at areas that are exposed to precipitation or that otherwise drain to a storm water conveyance at the facility after the date of three years prior to the effective date of this permit. Such list shall be updated as appropriate during the term of the permit.

d. Sampling Data.

A summary of existing discharge sampling data describing pollutants in storm water discharges from the facility, including a summary of sampling data collected during the term of this permit.

e. Risk Identification and Summary of Potential Pollutant Sources.

A narrative description of the potential pollutant sources at the following areas: loading and unloading operations; outdoor storage activities; outdoor manufacturing or processing activities; significant dust or particulate generating processes; and on-site waste disposal practices. The description shall specifically list any significant potential source of pollutants at the site and for each potential source; any pollutant or pollutant parameter (e.g., biochemical oxygen demand, etc.) of concerns shall be identified.

3. Measure and Controls.

The permittee shall develop a description of storm water management controls appropriate for the facility, and implement such controls. The appropriateness and priorities of controls in a plan shall reflect identified potential sources of pollutants at the facility. The description of storm water management controls shall address the following minimum components, including a schedule for implementing such controls:

a. Good Housekeeping.

Good housekeeping requires the maintenance of areas, which may contribute pollutants to storm waters discharges in a clean, orderly manner.

b. Preventative Maintenance.

A preventative maintenance program shall involve timely inspection and maintenance of storm water management devices (e.g., cleaning oil/water separators, catch basins) as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters, and ensuring appropriate maintenance of such equipment and systems.

c. Spill Prevention and Response Procedures.

Areas where potential spills, which can contribute pollutants to storm water discharges can occur, and their accompanying drainage points shall be identified clearly in the storm water pollution prevention plan. Where appropriate, specifying material handling procedures, storage requirements, and use of equipment such as diversion valves in the plan should be considered. Procedures for cleaning up spills shall be identified in the plan and made available to the appropriate personnel. The necessary equipment to implement a clean up should be available to personnel.

d. Inspections.

In addition to or as part of the comprehensive site evaluation required under Part III.4 (comprehensive site compliance evaluation) of this permit, qualified facility personnel shall be identified to inspect designated equipment and areas of the facility at appropriate intervals specified in the plan. A set of tracking or following or follow-up procedures shall be used to ensure that appropriate actions are taken in response to the inspections. Records of inspections shall be maintained.

e. Employee Training.

Employee training programs shall inform personnel responsible for implementing activities identified in the storm water pollution prevention plan or otherwise responsible for storm

water management at all levels of responsibility of the components and goals of the storm water pollution prevention plan. Training should address topics such as spill response, good housekeeping and material management practices. A pollution prevention plan shall identify periodic dates for such training.

f. Record-keeping and Internal Reporting Procedures.

A description of incidents such as spills that enter receiving waters via storm drainage, along with other information describing the quality and quantity of pollutants entering storm water discharges shall be included in the plan required under this part. Inspections and maintenance activities shall be documented and records of such activities shall be incorporated into the plan.

g. Non-Storm Water Discharges.

The plan shall include a certification that the discharge has been tested or evaluated for the presence of non-storm water discharges not addressed in this permit. The certification shall include the identification of potential significant sources of non-storm water at the site, a description of the results of any test and/or evaluation for the presence of non-storm water discharges, the evaluation criteria or testing method used, the date of any testing and/or evaluation, and the on-site drainage points that were directly observed during the test. Such certification may not be feasible if the facility operating the storm water discharge associated with industrial activity does not have access to an outfall, manhole, or other point of access to the ultimate conduit, which receives the discharge. In such cases, the source identification section of the storm water pollution plan shall indicate why the certification required by this part was not feasible, along with the identification of potential significant sources of non-storm water at the site.

Except for flows from fire fighting activities, sources of non-storm water listed above that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

The following non-storm water discharges may be authorized by this permit: discharges from fire fighting activities; fire hydrant flushings; potable water sources including waterline flushings; irrigation drainage; lawn watering; routine external building washdown which does not use detergents or other compounds; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

Sediment and Erosion Control.

The plan shall identify areas, which due to topography, activities, or other factors, have a high potential for significant soil erosion, and identify structural, vegetative, and/or stabilization measures to be used to limit erosion.

h. Management of Runoff.

The plan shall contain a narrative consideration of the appropriateness of traditional storm water management practices (practices other than those which control the generation or source(s) of pollutants) used to divert, infiltrate, reuse, or otherwise manage storm water runoff in a manner that reduces pollutants in storm water discharges from the site. The plan shall provide that measures determined to be reasonable and appropriate shall be implemented and maintained. The potential of various sources at the facility to contribute pollutants to storm water discharges associated with industrial activity (see Parts III.D.2 (description of potential pollutant sources) of this permit) shall be considered when determining reasonable and appropriate measures. Appropriate measures of collected storm water (such as for a process or as an irrigation source), inlet controls (such as oil/water separators), snow management activities, infiltration devices, and wet detention/retention devices.

4. Comprehensive Site Compliance Evaluation.

Qualified personnel shall conduct site compliance evaluations at appropriate intervals specified in the plan, but in no case less than once a year. Quarterly evaluations are recommended. Such evaluations shall provide:

a. Areas contributing to a storm water discharge associated with industrial activity shall be visually inspected for evidence of, or the potential for, pollutants entering the drainage system. Measures to reduce pollutant loadings shall be evaluated to determine whether they are adequate and properly implemented in accordance with the terms of the permit or whether additional control measures are needed. Structural storm water management measures, sediment and erosion control measures, and other structural pollution prevention measures identified in the plan shall be observed to ensure that they are operating correctly. A visual inspection of equipment needed to implement the plan, such as spill response equipment, shall be made.

b. Based on the results of the inspection, the description of potential pollutant sources identified in the plan in accordance with Part III.D.2 (description of potential pollutant sources) of this permit and pollution prevention measures and controls identified in the plan in accordance with paragraph III.D.3 (measures and controls) of this permit shall be revised as appropriate within two weeks of such inspection

and shall provide for implementation of any changes to the plan in a timely manner, but in no case more than twelve weeks after the inspection.

c. A report summarizing the scope of the inspection, personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph III.D.4.b (above) of the permit shall be made and retained as part of the storm water pollution prevention plan for at least one year after coverage under this permit terminates. The report shall be signed by the senior executive officer responsible for overall environmental control.

5. Consistency with other plans

Storm water pollution prevention plans may reflect requirements for Spill Prevention Control and Countermeasure (SPCC) plans developed for the facility under section 311 of the CWA or Best Management Practices (BMP) Programs otherwise required by an NPDES permit for the facility as long as such requirement is incorporated into the storm water pollution prevention plan.

6. Requirements for storm water discharges associated with Section 313 Water Priority Chemicals.

Storm water pollution prevention plans shall describe and ensure the implementation of practices, which are necessary to provide for conformance with the following guidelines:

a. In areas where Section 313 water priority chemicals are stored, processed or otherwise handled, appropriate containment, drainage control and/or diversionary structures shall be provided. At a minimum, one of the following preventive systems or its equivalent shall be used: (1) Curbing, culverting, gutters, sewers or other forms of drainage control to prevent or minimize the potential for storm water run-on to come into contact with significant sources of pollutants; or (2) Roofs, covers or other forms of appropriate protection to prevent storage piles from exposure to storm water, and wind.

b. In addition to the minimum standards listed under Part III.D.6.a (above) of permit, the storm water pollution prevention plan shall include a complete discussion of measures taken to conform with the following applicable guidelines, other effective storm water pollution prevention procedures, and applicable State rules, regulations and guidelines:

(1) Liquid storage areas where storm water comes into contact with any equipment, tank, container, or other vessel used for Section 313 water priority chemicals.

(a) No tank or container shall be used for the storage of a Section 313 water priority chemical unless its material and construction are compatible with the

material stored and conditions of storage such as pressure and temperature, etc.

(b) Liquid storage areas for Section 313 water priority chemicals shall be operated to minimize discharges of Section 313 chemicals. Appropriate measures to minimize discharges of Section 313 chemicals may include secondary containment provided for at least the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation, a strong spill contingency and integrity testing plan, and/or other equivalent measures.

(2) Material storage areas for Section313 water priority chemicals other than liquids. Material storage areas for Section 313 water priority chemicals other than liquids which are subject to runoff, leaching, or wind shall incorporate drainage or other control features which will minimize the discharge of Section 313 water priority chemicals by reducing storm water contact with Section 313 water priority chemicals.

(3) Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals. Truck and rail car loading and unloading areas for liquid Section 313 water priority chemicals shall be operated to minimize discharges of Section 313 water priority chemicals. Appropriate measures to minimize discharges of Section 313 chemicals may include: the placement and maintenance of drip pans (including the proper disposal of materials collected in the drip pans) where spillage may occur (such as hose connections, hose reels and filler nozzles) for use when making and breaking hose connections; a strong spill contingency and integrity testing plan; and/or other equivalent measures.

(4) Areas where Section313 water priority chemicals are transferred, processed or otherwise handled. Processing equipment and materials handling equipment shall be operated so as to minimize discharges of Section 313 water priority chemicals. Materials used in piping and equipment shall be compatible with the substances handled. Drainage from process and materials handling areas shall minimize storm water contact with section 313 water priority chemicals. Additional protection such as covers or guards to prevent exposure to wind, spraying or releases from pressure relief vents from causing a discharge of Section 313 water priority chemicals to the drainage system, and overhangs or door skirts to enclose trailer ends at truck loading/unloading docks shall be provided as appropriate. Visual inspections or leak tests shall be provided for overhead piping conveying Section 313 water priority chemicals without secondary containment.

(5) Discharges from areas covered by paragraphs (1), (2), (3) or (4).

(a) Drainage for areas covered by paragraphs (1), (2), (3) or (4) of this part should be restrained by valves or other positive means to prevent the discharge of a spill or other excessive leakage of Section 313 water priority chemicals. Where containment units are employed, such units may be emptied by pumps or ejectors; however, these shall be manually activated.

(b) Flapper-type drain valves shall not be used to drain containment areas. Valves used for the drainage of containment areas should, as far as is practical, be of manual, open-and-closed design.

(c) If facility drainage is not engineered as above, the final discharge of all in-facility storm sewers shall be equipped to be equivalent with a diversion system that could, in the event of an uncontrolled spill of Section 313 water priority chemicals, return the spilled material to the facility.

(d) Records shall be kept of the frequency and estimated volume (in gallons) of discharges from containment areas.

(6) Facility site runoff other than from areas covered by (1), (2), (3), or (4).

Other areas of the facility (those not addressed in paragraphs (1), (2), (3) or (4), from which runoff which may contain Section 313 water priority chemicals or spills of Section 313 water priority chemicals could cause a discharge shall incorporate the necessary drainage or other control features to prevent discharge of spilled or improperly disposed material and ensure the mitigation of pollutants in runoff or leachate.

(7) Preventive maintenance and housekeeping.

All areas of the facility shall be inspected at specific intervals identified in the plan for leads or conditions that could lead to discharges of Section 313 water priority chemicals or direct contact of storm water with raw materials, Intermediate materials, waster materials or products. In particular, facility piping, pumps, storage tanks and bins, pressure vessels, process and material handling equipment, and material bulk storage areas shall be examined for any conditions or failures, which could cause a discharge. Inspection shall include examination for leaks, wind blowing, corrosion, support or foundation failure, or other forms of deterioration or noncontainement. Inspection intervals shall be specified in the plan and shall be based on design and operational experience.

Different areas may require different inspection intervals. Where a leak or other condition is discovered which may result in significant releases of Section 313 water priority chemicals to the drainage system, corrective action shall be immediately taken or the unit or process shut down until corrective action can be taken. When a leak or noncontainement of a Section 313 water priority chemical has occurred, contaminated soil, debris, or other material must be promptly removed and disposed in accordance with Federal, State, and local requirements and as described in the plan.

(8) Facility security.

Facilities shall have the necessary security systems to prevent accidental or intentional entry, which could cause a discharge. Facility systems described in the plan shall address fencing, lighting, vehicular traffic control, and securing of equipment and buildings

(9) Training.

Facility employees and contractor personnel that work in areas where SARA Title III, Section 313 water priority chemicals are used or stored shall be trained in and informed of preventive measures at the facility. Employee training shall be conducted at intervals specified in the plan, but not less than once per year, in matters of pollution control laws and regulations, and in the storm water pollution prevention plan and the particular features of the facility and its operation which are designed to minimize discharges of Section 313 water priority chemicals. The plan shall designate a person who is accountable for spill prevention at the facility and who will set up the necessary spill emergency procedures and reporting requirements so that spills and emergency releases of Section 313 water priority chemicals can be isolated and contained before a discharge of a Section 313 water priority chemical can occur. Contractor or temporary personnel shall be informed of facility operation and design features in order to prevent discharges or spills from occurring.

(10) Engineering Certification.

The storm water pollution prevention plan for a facility subject to SARA Title III, Section 313 requirements for chemicals, which are classified as 'Section 313 water priority chemicals', shall be reviewed by a Registered Professional Engineer and certified to by such Professional Engineer. A Registered Professional Engineer shall recertify the plan every three years thereafter or as soon as practicable after significant modification are made to the facility. By means of these certifications the engineer, having examined the facility and being familiar with the provisions of this part, shall attest that the storm water pollution prevention plan has been prepared in

accordance with good engineering practices. Such certification shall in no way relieve the permittee of their duty to prepare and fully implement such plan.

IV. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling.

Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge.

B. Monitoring Procedures.

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. Reporting of Monitoring Results.

Monitoring results shall be summarized each month on the Discharge Monitoring Report (DMR) for (EPA No. 3320-1). The reports shall be submitted monthly and are to be postmarked by the 10th day of the following month. Toxicity test results shall be submitted according to Part 1.B.3.f., above. Legible copies of these, and all other reports, shall be signed and certified in accordance with the requirements of Part IV.H., Signatory Requirements, and submitted to the Director, Water Division and the State agency at the following addresses:

original to:

United States Environmental Protection Agency (EPA) Region 10
1200 Sixth Avenue, WD-135
Seattle, Washington 98101

copy to:

Washington Department of Ecology, NWRO
Water Quality Section
Mail Stop NB-81
3190 160th Avenue SE
Bellevue, Washington 98008-5452

D. Additional Monitoring by the Permittee.

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated.

E. Records Contents.

Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and
6. The results of such analyses.

F. Retention of Records.

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of sample, measurement, report, or application. This period may be extended by request of the Director at any time. Data collected on-site, copies of Discharge Monitoring Reports, and a copy of this NPDES permit must be maintained on-site during the duration of activity at the permitted location.

G. Twenty-four Hour Notice of Non-Compliance Reporting.

1. The following occurrences of non-compliance shall be reported by telephone within 24 hours from the time the permittee becomes aware of the following circumstances:
   a. Any unanticipated bypass which exceeds any effluent limitation in the permit;
   b. Any upset which exceeds any effluent limitation in the permit; or;
   c. Significant spills (see definitions) into receiving waters of the following materials:
      1. 100 gallons or more of domestic wastewater (sewage).
      2 Any substance in excess of a reportable quantity as listed in 40 CFR 117.
      3. Any substance that is classified, or could reasonably be expected to classify, as hazardous waste as required by WAC 173-303-145.

2. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances requiring 24-hour notification per part IV. G.1. The written submission shall contain:
   a. A description of the noncompliance and it's cause;
   b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3. The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Compliance Section in Seattle, Washington, (206) 553-1213 or Washington Operations Office (206) 753-9437.

Telephone notification shall also be provided to the Bremerton-Kitsap County Health District and the Suquamish Tribe of spills of materials addressed under part IV.G.1.d.

4. Reports shall be submitted to the addresses in Part IV.C. Reporting of Monitoring Results.

H. Other Noncompliance Reporting.

Instances of noncompliance not required to be reported within 24 hours per part IV.G.1. shall be reported at the time that monthly discharge monitoring reports are submitted per part IV.C. The reports shall contain the information listed in Part IV.G.2.

I. Inspection and Entry.

The permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the Act, any substances or parameters at any location.

J. Compliance Schedules.

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 10 days following each schedule date.

V. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply.

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

B. Penalties for Violations of Permit Conditions.

1. Civil Penalty. The Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 318, or 405 of the Act shall be subject to a civil penalty, not to exceed $25,000 per day for each violation.

2. Criminal Penalties:

a. Negligent Violations. The Act provides that any person who negligently violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act shall be punished by a fine of not less than #2,500 nor more than $25,000 per day of violation, or by imprisonment for not more than 1 year, or by both.

b. Knowing Violations. The Act provides that any person who knowingly violates a permit condition implementing Sections 301, 302, 306, 307, 308, or 405 of Act shall be punished by a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or by both.

c. Knowing Endangerment. The Act provides that any person who knowingly violates a permit condition implementing Sections 301, 302, 306, 318, or 405 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. A person, which is an organization, shall, upon conviction of violating this subparagraph, be subject to a fine of not more than $1,000,000.

d. False Statements. The Act provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this Act or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this Act, shall upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or by both.

Except as provided in permit conditions in Part V.G., Bypass of Treatment Facilities and Part V.H., Upset Conditions, nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

F. Removed Substances.

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

G. Bypass of Treatment Facilities:

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs 2 and 3 of this section.

2. Notice:

a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part IV.G., Twenty-four Hour Notice of Noncompliance Reporting.

3. Prohibition of bypass.

   a. Bypass is prohibited and the Director may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage.

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

      (3) The permittee submitted notices as required under paragraph 2 of this section.

   b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines paragraph 3.a. of this section.

H. Upset Conditions.

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph 2 of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated;

   c. The permittee submitted notice of the upset as required under Part IV.G, Twenty-four Hour Notice of Noncompliance Reporting; and

   d. The permittee complied with any remedial measures required under Part V.D., Duty to Mitigate.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Toxic Pollutants.

The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

VI. GENERAL REQUIREMENTS

A. Changes in Discharge of Toxic Substances. Notification shall be provided to the Director as soon as the permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. One hundred micrograms per liter (100 ug/l);

   b. Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophonol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

   c. Five 95) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   a. Five hundred micrograms per liter (500 ug/l);

   b. One milligram per liter (1 mg/l);

   c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CRF 122.21(g)(7); or

   d. The level established by the Director in accordance with 40 CFR 122.44(f).

B. Planned Changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source as determined in 40 CFR 122.29(b); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants, which are subject neither to effluent limitations in the permit, nor to notification requirements under Part IV.A.1.

C. Anticipated Noncompliance. The permittee shall also give advance notice of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

D. Permit Action. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

E. Duty to Reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application should be submitted at least 180 days before the expiration date of this permit.

F. Duty to Provide Information. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

G. Other Information. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.

H. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer.
   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively
   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative on if:

   a. The authorization is made in writing by a person described above and submitted to the Director.

b. The authorization specified either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under paragraph IV.H.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph IV.H.2. must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

I. Availability of Reports. Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the State water pollution control agency and the Director. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers. This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Director at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittee's containing a specific date for the transfer of permit responsibility, coverage, and liability between them; and

3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.

N. State Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Act.

Permit No.: WA-000206-2

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et seq. , as amended by the Water Quality Act of 1987, p . l . 100-4, the "Act",

Department of Defense
Department of the Navy
Puget Sound Naval Shipyard
Bremerton, Washington 98314

is authorized to discharge from facility located at Bremerton, Washington

to receiving waters named Sinclair Inlet,

in accordance with discharge point(s), effluent limitations, monitoring

requirements and other conditions set forth herein.

This permit shall become effective April 1, 1994

This permit and the authorization to discharge shall expire at midnight April 1, 1999

Signed this 2nd day of March, 1994.

//SS//
Director, Water Division, Region 10
U.S. Environmental Protection Agency

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Attachment 2: Temperature Reduction Scoping Estimate

Puget Sound Naval Shipyard & Intermediate Maintenance Facility AKART Study

Scoping Estimate
Prepared by
Code 980

Install Vessel Noncontact Cooling Water Temperature Reduction Equipment

Drydocks 1-6

Install Cooling Water Temperature Reduction at Drydocks
Date: September 15, 2008

Contents

Install Cooling Water Temperature Reduction at Drydocks
Date: September 15, 2008

I. Problem Description

Ships that are undergoing repair, modification or overhaul in the drydocks located at the Puget Sound Naval Shipyard require saltwater cooling for machinery that operates within the ships. The discharged saltwater temperature can range as high as 77 degrees F and is mixed with the drydock's hydrostatic relief ground water. Temperatures measured at the outfall have been recorded at a maximum of 64.8 degrees F. The EPA has mandated that the maximum discharge temperature be no greater than 60 degrees F. This problem can be resolved by lowering the single pass saltwater cooling water to approximately 70 F. (option A) or 60 degrees F (option B), before it is comingled with drydock hydrostatic relief ground water.

II. General Scope of work

Option A - Identify and size equipment required at the drydocks to lower the temperature of the 77 degree saltwater discharge to approximately 70 degrees before it is mixed with the drydock hydrostatic relief ground water. A cost estimate is also included with the Scope of Work.

Option B - Identify and size equipment required at the drydocks to lower the temperature of the 77 degree saltwater to approximately 60 degrees before it is mixed with the drydock hydrostatic relief ground water. A cost estimate is also included with the Scope of Work.

Operating costs for both options are calculated at 1.5 KW/ton of cooling at a cost of 10 cents per kWh.

III. Drydock 1-5

1. Option A - Design Criteria (cooled to 70 degree discharge temp.)

   These chiller/chillers will set on the dock floor and will be fed by gravity. No additional pumping is required.

   a. There is approximately 3125 GPM of ships' saltwater between the docks. The actual flow per ship used for this evaluation is approximately 1,100 GPM (Maximum submarine flow) at a maximum of 77 degrees. It is calculated that the temperature should be reduced by seven degrees prior to mixing with drydock hydrostatic relief ground water.

   b. A 1,100 GPM with a reduction of 7 degrees will require a 320 ton of chiller.

Install Cooling Water Temperature Reduction at Drydocks
Date: September 15, 2008

c. The chiller will be mounted on portable skids and will be powered by 480 KW at 460 volts. The weight of the units is approximately 22,000 pounds. With a foot print of 8' X 37'

2. Option A Cost Estimate
   a. Each chiller unit is approximately $220K- $267K
   b. Skid mounting the unit is approximately $25K
   c. Total each unit is $245K - $292K
   d. Four units at $292K = **$1168K Total** (no saltwater used in DD3)
   e. Monthly operating costs per unit = $ 34,500

3. Option B - Design Criteria (cooled to 60 degree discharge temp.)
   a. The actual flow per ship used for evaluation is approximately 1,100 GPM at a maximum of 77 degrees. It is calculated that the temperature should be reduced by seventeen degrees prior to mixing with drydock hydrostatic relief ground water.
   b. A 1,100 GPM with a reduction of 17 degrees will require 780 ton of chiller.
   c. Two 400 ton chillers would be used. They would be mounted on portable skids and will require a total of 1,170 KW at 460 volts. The weight of the two units is approximately 40,000 pound, with a foot print of 18' X 30' each.

4. Option B Cost Estimate
   a. Two chillers is approximately $550K- $650K
   b. Skid mounting the unit is approximately $50K
   c. Each pair is $600K - $700K
   d. Four drydocks at $700K = **$2800K Total** (no saltwater used in DD3)
   e. Monthly operating costs per drydock = $ 84,240

IV. **Drydock 6**

1. Design Criteria - Option A (cooled to 70 degree discharge temp.)

Install Cooling Water Temperature Reduction at Drydocks
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a. There is approximately 6,500 GPM of saltwater used in the dock. This is the flow with a Nimitz class carrier in dock. A maximum of 77 degrees has been recorded on the discharge from the ship. It is calculated that the temperature should be reduced by seven degrees prior to mixing with drydock hydrostatic relief ground water.

b. A 6,500 GPM flow with a reduction of 7 degrees will require a 2000 ton chiller.

c. The chiller will be mounted on a fixed pad at the street level

d. A manifold and piping system will be required to collect the ships discharge water in the drydock.

e. A 250 HP motor and pump will be required to move the water from the dock floor to the chiller at street level.

f. A 3000 KW power system is required to operate the chiller at 4160 volts.

g. A pad and cover will be required for the chiller.

h. Approximate footprint is 20' X 50'

2. Cost Estimate - Option A

a. The chiller unit will cost between $1200K – $1400K

b. A pad and cover for chiller is approximately $20K

c. A piping manifold with valves is approximately $20K

d. A 6,500 GPM Pump and motor is approximately $350K

e. Additional piping is approximately $15K

f. A 3000KW power connect for the 4160 volts to the chiller with transformer is approximately $350K

g. A&E project design $100K

h. Construction costs and contractor profit & overhead $ 350K

g. Total is between **$2405K – $2605K**

Note: Monthly operating cost to power chiller is $216,000
Monthly operating cost to power the lift pump is $18,000
Total Monthly cost is $234,000

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Install Cooling Water Temperature Reduction at Drydocks
Date: September 15, 2008

1. Design Criteria - Option B (cooled to 60 degree discharge temp.)
   a. There is approximately 6,500 GPM of saltwater used in the dock. This is the flow with a Nimitz class carrier in dock. A maximum of 77 degrees has been recorded on the discharge from the ship. It is calculated that the temperature should be reduced by 17 degrees prior to mixing with drydock hydrostatic relief ground water.
   b. A 6,500 GPM flow with a reduction of 17 degrees will require 4600 ton chiller.
   c. The chiller will be mounted on a fixed pad at the street level
   d. A manifold and piping system will be required to collect the discharge water in the drydock.
   e. A 250 HP motor and pump will be required to move the water from the dock floor to the chiller at street level.
   f. A 7000 KW power system is required to operate the chiller at 4160 volts.
   g. A pad and cover will be required for the chiller.
   h. Approximate footprint is 70' X 60'

2. Cost Estimate - Option B (60 degree discharge temp.)
   a. The chiller units will cost between $2300K – $2600K
   b. A pad and cover for chiller is approximately $60K
   c. A piping manifold with valves is approximately $20K
   d. A 6,500 GPM Pump and motor is approximately $350K
   e. Additional piping is approximately $30K
   f. A 7000KW power connect for the 4160 volts to the chiller with transformer is approximately $1000K
   g. A&E project design $200K
   h. Construction costs and contractor profit & overhead $ 500K
   g. Total is between **$4460K – $4760K**

Note: Monthly operating cost to power chiller is $496,800
Monthly operating cost to power the lift pump is $18,000
Total Monthly cost is $514,800

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Install Cooling Water Temperature Reduction at Drydocks
Date: September 15, 2008

V. Summary of Costs

Drydock 1-5 Option A

Capital Equipment Total = $1168K

Monthly Operating Cost (4 docks) = $138K

Drydock 1-5 Option B

Capital Equipment Total = $2800K

Monthly Operating Cost (4 docks) = $337K

Drydock 6 Option A

Capital Equipment Total = $2605K

Monthly Operating Cost = $234K

Drydock 6 Option B

Capital Equipment Total = $4760K

Monthly Operating Cost = $515K

General Note: 1. This is not a design, but a scope and estimate.
2. Scoping estimates are accurate to 25%.

-End of Scoping Estimate-

Attachment 3: Current PSNS&IMF BMPs

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study

BMP 1 YARD CLEANUP

Description of Potential Pollutant Source: Dirt, surplus materials, and spilled or dropped materials are often allowed to accumulate in loading docks, storage areas, and waterfront work areas. Pollutants from accumulated material can be transported by storm water.

Description of BMP: The Shipyard will be cleaned on a regular basis to minimize loss of accumulated debris into Sinclair Inlet or the storm drainage system. Do not clean paved areas, equipment, buildings, etc., using wet methods (hosing down) unless conditions of Appendix C of NAVSHIPYDPUGETINST P5090.30A have been met.

Responsible shops or zone managers shall conduct weekly cleanliness inspections of outdoor work and storage areas. Provide cleaning of work areas as necessary to maintain control of potential pollutants.

BMP 2 DRY DOCK CLEANUP

Description of Potential Pollutant Source: Recycling operations, which are currently the majority of dry dock work in progress, result in deposits of contaminants such as metals, paint debris, and miscellaneous trash on the dry dock floor. If these materials remain on the dry dock floor, they will be carried by storm water (or groundwater in the floor channels) into the dry dock drainage system. This results in a violation of the Shipyard's National Pollution Discharge Elimination System (NPDES) permit.

Description of BMP: All personnel (or, if applicable, a designated cleanup crew) working in the dry dock, shall collect and properly dispose of wastes (e.g., wood, plastic, paint chips, discarded construction materials, residual sandblast grit, grinding debris, paper, welding residue, ear plugs, cigarette butts, rags, sediments, and insulation) prior to the end of each work shift.

BMP 3 MATERIALS STORAGE AND HANDLING

Description of Potential Pollutant Source: Liquid materials such as paints, fuels, solvents, and liquid wastes, have an increased potential for release into surrounding waters via the storm drain system, when stored in uncovered outdoor areas, particularly when storm drains are nearby. Minor damage can occur to containers, allowing unnoticed seepage of contents into storm drains. Spills can occur when materials are handled. Escape into nearby storm drains can occur if proper precautions are not taken.

Description of BMP: Protect containers storing liquid wastes or other liquids, which have the potential of adding pollutants to water (e.g., fuels, paints, and solvents), from the weather in a protected, secure location away from drains. Proper protection methods include placing materials inside a cofferdam, inside a covered area, underneath tarps, or using rubber mats over storm drains.

Do not store parts, materials, and containers directly on the pavement, dry dock floor, or ground.

BMP 4 CONTAINMENT AND CONTROL OF DUST AND OVERSPRAY

Description of Potential Pollutant Source: Sanding, abrasive blasting, and painting create wastes that may become exposed to storm water. Debris from these activities, as well as those

from welding and grinding, can be transported to storm drains and receiving waters if not properly collected and disposed.

Description of BMP: Carry out any activity that generates pollutants, (e.g., blasting, painting, metal finishing, welding, grinding) in enclosed, covered areas.

Take applicable measures to adequately contain spent blast grit, paint chips and paint overspray to prevent the discharge of these materials into Sinclair Inlet.

Perform spray paint operations in a manner to contain overspray and spillage, and minimize emission of particulates.

Perform all dry-blasting operations within an enclosure with adequate dust collection, and in accordance with the appropriate Shipyard Industrial Process Instruction.

BMP 5 DRIP PANS

Description of Potential Pollutant Source: Leaking connections, valves, pipes, and hoses carrying liquids such as oil, fuel, solvent, industrial wastewater, paint, and liquid waste can allow escape of pollutants to surface waters. Equipment such as pumps, air conditioners, and boilers may also leak fluids. Use drip pans where possible.

Description of BMP: Use drip pans or other protective devices at hose connections when transferring oil, fuel, solvent, industrial wastewater, and paint. Where design constraints, vertical connections, or interferences do not allow placement of drip pans, use other measures, such as chemical resistant drapes.

Where a spill would likely occur, use drip pans or other protective devices when making and breaking connections, or during component removal operations.

BMP 6 VEHICLE/EQUIPMENT CLEANING

Description of Pollutant Source: Washing equipment and vehicles outdoors or in areas where wash water flows onto the pavement, can pollute storm water. Washing vehicles and equipment at any location in the industrial or industrial support areas, other than at the vehicle wash facility, is unauthorized.

Description of BMP: Only wash vehicles and equipment in designated approved cleaning areas with liquid wastewaters routed to the sanitary sewer. Vehicle cleaning is allowed only at the west end of Building 455. Contact Code 106.31, at extension 6-0118, for approved equipment cleaning areas.

BMP 7 VEHICLE AND EQUIPMENT PREVENTIVE MAINTENANCE

Description of Potential Pollutant Source: Equipment may leak fuel, grease, oil, or other pollutants due to corrosion, loose fittings, poor welding, and improper or poorly fitted gaskets.

Description of BMP: Inspect all government vehicles and equipment for leaks before use. Maintain them in good condition at all times. Inspect infrequently used vehicles and equipment monthly for leaks.

Inspect all equipment and vehicles for fluid leaks before placing them in a dry dock. If equipment in a dry dock is found to be leaking, repair it or remove it from the dry dock immediately.

BMP 8 MATERIAL LOADING/UNLOADING

Description of Potential Pollutant Source: Vendor deliveries may contain spilled material or damaged containers. Subsequent loading/unloading within the Shipyard may also result in damage to containers.

Shipyard designated loading/unloading areas are graded to facilitate flow to storm drains.

Description of BMP: When loading and unloading liquids and fine granulated materials from trucks and trailers at outdoor loading areas, prevent potential spills to storm drains by placing or installing a door skirt, door seal, valved storm drain line, or mats over the storm drains.

BMP 9 OVER-WATER PROTECTION

Description of Potential Pollution source: Debris producing work operations can deposit pollutants into Sinclair Inlet when performed over water without proper controls. Take measures to prevent discharge of spent abrasive, paint chips, paint and other debris into Sinclair Inlet. Hanging plastic barriers or tarpaulins beneath work operations may adequately contain debris.

Description of BMP: For over-water work provide and position floats, tarps, or other suitable protection adjacent to and under work area to contain debris. Work that has a potential for pollution may include, but is not limited to, painting, paint chipping, blasting, welding, grinding, cutting, chipping, and sanding. No paint or paint residue shall enter Sinclair Inlet. If windy conditions prevent adequate containment of pollutants, stop work until conditions allow.

BMP 10 TREATED WOOD PRODUCTS

Description of Potential Pollution Source: Wood products intended for outdoor use are generally coated with toxic chemicals.

Description of BMP: Consider substituting alternate materials for treated wood products. Where feasible, store treated wood, under cover on pallets or indoors, when not in use.

BMP 11 DISCHARGES INTO STORM DRAINS

Description of Potential Pollutant Source: Storm water runoff may contain a complex mixture of suspended solids, nutrients, bacteria, viruses, and toxic materials. NAVSHIPYDPUGETINST 5090.30A specifies requirements for non-storm water discharges. Unauthorized non-storm water discharges are a violation of the NPDES permit. Leaks or spills of toxic or hazardous pollutants into storm drains require spill response actions per NAVSHIPYDPUGETINST P5090.1F.

Description of BMP: Unless authorized by Code 106.3 or NAVSHIPYDPUGETINST 5090.30A, do not discharge anything into the Shipyard's storm drains.

Do not dump pollutants on the ground. (See Appendix A of NAVSHIPYDPUGETINST 5090.30A for definition of pollutants).

If pollution prevention techniques prove inadequate, contact Code 106.3 regarding using catch basin filters and/or absorbent blankets.

If you must carry out operations which could spill significant materials (e.g., liquid hazardous materials or wastes, wastewater, fuels) near a storm drain, place a chemical resistant mat or other protective device over the storm drain during the operation.

BMP 12 STORM SEWER SYSTEM CLEANING AND MAINTENANCE

Description of BMP: Clean catch basins when the depth of deposits are equal to or greater than one-third the depth from the basin to the invert of the lowest pipe into or out of the basin. Inspect catch basins to determine frequency of cleaning. The shop or code responsible for the cleanliness of assigned zones will accomplish those inspections. The receiving shop will be responsible for catch basin inspections in loading and unloading areas at building doors or loading docks. Cleaning services for all catch basins will be provided by Code 952.1. Contact Shop 07 at extension 6-4125 for catch basin cleaning services.

BMP 13 OUTDOOR WORK OPERATIONS

Description of Potential Pollutant Source: Various outdoor work operations can produce debris which, if left unattended, can eventually enter surface waters. Outdoor sanding, cutting, and

painting (BMP 4), material transfer and mixing, use of oils, solvents, detergents, and degreasers during work operations are examples of activities which can leave residues which will be transported by storm water if not properly controlled.

Description of BMP: When performing outdoor work operations, have equipment and supplies on-hand to control and clean up debris. Consider the potential risks of your work and prepare accordingly. Items you may need include a spill kit, drop cloths, absorbents, rubber mats, storm drain filters, tape, tarps, brooms, or vacuums.

Attachment 4: Permit Limits and Benchmark Analysis

Puget Sound Naval Shipyard & Intermediate Maintenance Facility AKART Study

Permit limits associated with dry dock effluent and stormwater discharges for similar facilities may relate to the level of technology/management practices employed. This attachment is an evaluation of permit limits and benchmark values outlined in Section 10.0. Table 10-2 summarizes numeric permit limits and benchmark values and is the main information source for the evaluation. There are some considerations when comparing permit limits across a number of facilities:

- Permit limits are based on employed treatment technology (technology-based), water-quality, or best professional judgment of the permit writer. Since AKART is a technology-based construct, comparison with technology-based permit limits is most applicable. Permit limits, however, are not clearly designated as to their derivation.
- There is wide variation in the discharges from the shipyards evaluated. The receiving water could be fresh or marine water; non-contact cooling water volumes will vary; some dry docks discharge hydrostatic groundwater relief; climatic conditions vary; regulations vary by state; and therefore there are derivations of permit limits.
- The evaluation will look at the pollutants of concern as determined in Section 6.0.

Copper – Dry Dock: For dry docks, copper is typically a water-quality based limit so the relationship to AKART is limited. Copper limits in dry docks have great variability depending upon the status of the receiving water, the type of docks (floating or graving with its associated relief water) and the reasonable availability of a POTW with capacity to accept the volume of water from the dry docks in question. For large facilities, PSNS & IMF's current limits for copper are the lowest at 19 µg/l. Pearl is at 23 µg/l but is in the process of being raised to 50 µg/l to reflect new data reflecting the water quality of Pearl Harbor for copper. Norfolk has limits of 335 µg/l.

Copper – Stormwater: Currently PSNS&IMF does not monitor for copper in non-dry dock stormwater. NASSCO and Todd collect stormwater and discharge it into the sanitary sewer. If Todd were to have an emergency overflow the limit is 5.78 µg/l. Cascade has a 100 µg/l benchmark. Both Electric Boat and Norfolk monitor for copper but do not have a limit or benchmark. The MSGP has a copper benchmark value of 63.6µg/l (EPA 2000). Per Section 9.0, the mean PSNS&IMF stormwater copper concentration is 63 µg/l, which is reasonably in line with the benchmarks for Cascade and the MSGP. For the limited outfall data available it does appear that copper levels have decreased with the possible exception of Outfall 003(124). Copper benchmarks and associated monitoring, as will likely be implemented in the renewed PSNS&IMF NPDES permit, will help evaluate the effectiveness of BMPs.

Zinc – Dry Dock: For dry docks, zinc is typically a water-quality based limit so the AKART evaluation is not fully instructive. Additionally, PSNS&IMF does not have a zinc limit, meaning that there was no reasonable potential to exceed water quality standards when the permit was developed. Cascade has a maximum limit of 1,000 µg/l, Electric Boat 1,400 µg/l, and Norfolk 765 µg/l. Overall there is no likely AKART driver stemming from zinc since copper is more critical (controlling factor). AKART implementation from copper limitations will lend itself to equal or greater control of zinc.

Zinc – Stormwater: Currently PSNS&IMF does not monitor for zinc in non-dry dock stormwater. The Cascade benchmark is 600 µg/l, Electric Boat and Norfolk monitor but do not have a limit/benchmark. The MSGP has a zinc benchmark value of 117 µg/l (EPA 2000). Per Section 9.0, the mean PSNS&IMF stormwater zinc concentration is 149 µg/l, which is above the MSGP benchmark but below the Cascade

benchmark. For the limited outfall data available it does appear that zinc has decreased with the exception of Outfalls 003(124) and 010(081.1) which shows no change. Zinc benchmarks and associated monitoring, as will likely be implemented in the renewed PSNS&IMF NPDES permit, will help evaluate the effectiveness of BMPs.

Oil & Grease – Stormwater: Oil & Grease limits are typically technology based and relate to AKART. PSNS&IMF no longer monitors stormwater for Oil & Grease (or other related petroleum parameters). Cascade has a 10 mg/l benchmark value. The MSGP has a benchmark value of 15 mg/l. If benchmark monitoring of Oil & Grease at PSNS&IMF were implemented it might reinforce working BMPs and identify the need for additional ones. Oil & Grease benchmarks and associated monitoring, as will likely be implemented in the renewed PSNS&IMF NPDES permit, will help evaluate the effectiveness of BMPs.

Attachment 5: BMP Supporting Information

Puget Sound Naval Shipyard & Intermediate Maintenance Facility AKART Study

This attachment provides supporting information related to BMP implementation at PSNS&IMF. Included is:

BMP – Type Controls Overview
Portable Fuel Storage Tanks
Shipyard, Ships Force, and Contractor Over-Site at the Deck Plate
Contractor Water Pollution Prevention
Dry Dock Inspections
Dry Dock and Stormwater Inspections
Code 106.32 Storm Drain Discharge Approval Form

BMP-TYPE CONTROLS OVERVIEW

There are other instructions within the BNC, other than BMPs, that control process policies and procedures. The Shipyard stormwater policies and BMPs are incorporated into these instructions. The various Shipyard instructions are explained below.

Shipyard Policies, Shipyard instructions and Process Instructions

a. Shipyard instructions establish or explain important basic organizational policies and procedures, which are beyond the scope of any particular office or department. Code 1102.3 publishes an index of these instructions on the Shipyard Intranet.

b. Shipyard Process Instructions (PIs), Industrial Process Instructions (IPIs), and Uniform Industrial Process Instructions (UIPIs) are instructions for processes, which are commonly used throughout the Shipyard. Code 241.2 publishes an index of these instructions on the Code 200 Department web page via the Shipyard Intranet.

c. Interface Engineering Instruction (IEIs) are required to provide technical control of production work on non- shipboard or non-project work. IEIs establish and maintain technical control of production work on plant equipment, temporary support systems/services, and various other evolutions.

List of Policies, Instructions, and Plans

- The SPCC plan: Used for liquid spills, prevention and counter measures.
- IPI 0000-913C, Portable Gasoline & Diesel Fuel Storage Tanks. This instruction specifies the use of portable fuel tanks within the BNC to fueling onboard ship or in the dry docks only. All other fueling of rolling stock is done on a scheduled basis with a fuel truck.
- IEI 248.37, Dry Dock Cleaning Instruction. This instruction dictates what the requirements are to clean the dry docks for various dry dock activities.
- Storm Water Inspections Zones: The BNC is laid out into nine specific storm water zones for inspection and reference purposes. Within each of these zones, the various outfalls for buildings and areas are defined and noted for quick reference. SPCC managers and fire departments use this manual to identify outfall locations for spill response.
- PSNS&IMF Instruction 5090.1H and PSNS&IMF Instruction 5090.9E address issues concerning Oil, Hazardous, Substance spill and contingency information.
- PSNS&IMF Instruction 5090.10C addresses fugitive emissions concerning painting and overspray.
- IPI 0630-910A, Abrasive Basting Instruction. This instruction addresses the blasting process for PSNS&IMF personnel.
- IPI-631-905B, Painting General Requirements. This instruction addresses the requirements for painting.
- PSNS&IMF Instruction P4110.1E, Hazardous Material Control. Addresses the control and storage of hazardous material.
- PSNS&IMF Instruction P5090.5F, Waste Management Plan. This instruction addresses the handling and storage of hazardous waste.

- PSNS&IMF Instruction P5090.30, Water Pollution Prevention and Control Plan. This instruction addresses the requirements for the control and prevention of water pollution within the BNC.

PORTABLE FUEL STORAGE TANKS

The shipyard restricts the fueling of vehicles by portable fuel tanks. Portable fuel tank are only to be used inside the dry dock or onboard a ship. The portable fuel tanks are locked inside a fenced area until needed. The fueling process is found in Industrial Process Instruction 0000-913C.

Portable fuel tanks are used to fuel equipment throughout the shipyard. The fuel tanks are stored topside in a fenced area. Cranes are used to lower the tanks into the dock to fuel the equipment.

Use of these portable fuel tanks as a "Fuel Station" topside can result in a discharge of pollutants into the storm drain system and will be prohibited. The Public Works fueling schedule currently is being modified to adjust to the fueling prohibition. Starting June 1st 2004 the portable fuel tank areas will be locked and unavailable for topside fueling.

The requirements for the use of portable fuel storage tanks can be found in IPI 0000-913C. The major changes in the IPI are:

- Portable gasoline and diesel fuel storage tanks can only be used to fuel equipment either in a dry dock or onboard a ship.
- Portable gasoline and diesel fuel storage tanks cannot be used to fuel equipment topside.
- Code 740 personnel will be responsible for fueling equipment in the dock or aboard a ship from the tanks.
- The tanks shall be secured in such a way as to prevent their use as topside fueling stations.

How topside fueling is accomplished?

Public Works (N444.52) currently fuels equipment within the Bremerton Naval Complex.

The Environmental Branch performs environmental, safety and health oversite functions at the deck plates. These Inspections are performed on a daily basis. A Environmental, Safety and Health Manager (ESH) usually is assigned to each project within our shipyard. The ESH manager oversees Shipyard, Contractor and Ships force workers.

SHIPYARD, SHIPS FORCE, AND CONTRACTOR OVER-SITE AT THE DECK PLATE

The Environmental, Safety, and Health (ESH) representative is tasked to ensure compliance with Environmental, Safety and Occupational Health standards, regulations and procedures for work performed by the shipyard, ships force and contractors while at the Bremerton Naval Complex (BNC).

The ESH representative must have a thorough knowledge of ESH standards, regulations and procedures as well as what is written in the contract.

In addition, the ESH representative must have a working knowledge of contract administration and oversight of contractor performance for adherence to ESH requirements.

The ESH representative is tasked to perform in-briefings (as requested) and to frequently perform on-site ESH evaluations of ship maintenance, repair, overhaul, and refueling in various industrial shops and aboard ships. The ESH manager coordinates all environmental, Safety and Health issues with Code 106 program managers prior to work being performed to ensure compliance with various types of industrial processes. Deck plate inspections are performed daily and all inspection information is entered into a data base. Information from this data base is used to perform metrics concerning shipyard, ships force and contractor performance. The following are the programs that the ESH manager must have knowledge of to ensure compliance on the project.

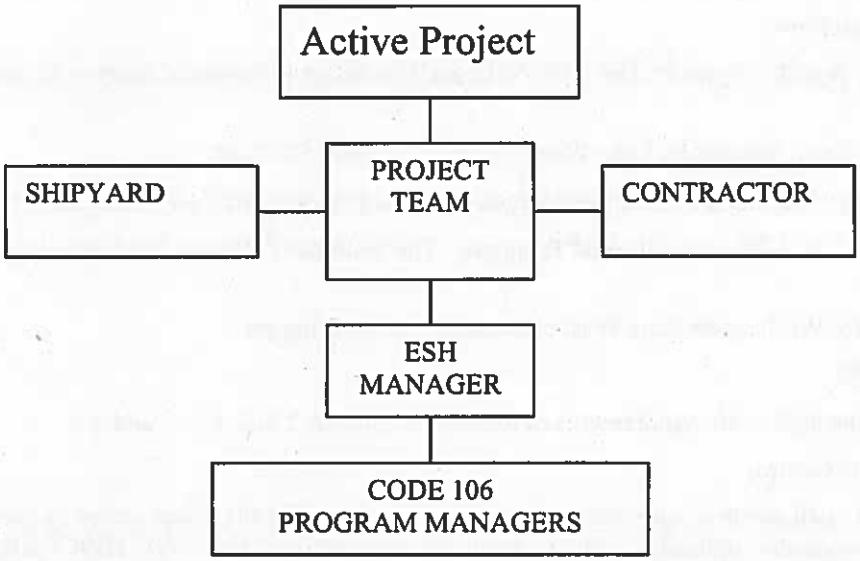
- Management of HAZMAT
  - CHMI approval requests including MSDS
  - Storage
  - GFM (bar codes)
  - Marine coatings
  - NESHAP
  - Labeling
  - Usage Reports
  - Prohibited HazMat
- WASTE Management
  - Sample Results
  - Pre-Designation wastes generated
  - Pre-Designation of non-usable HAZMAT (including Empty containers)
  - Solid Waste Tracking Sheet
  - Monthly Waste Summary Report
  - Request for SAA
  - Request for 45 day HW accumulation
- Inspection requirements
  - HW or WAD Turn-In procedures

- Labeling
- Secondary Containers
- Training
- ACM Wastes (asbestos containing)
- Recycle

- Environmental, Safety & Health Concerns:
  - Smoking
  - PPE
  - Eating Areas
  - Spill Prevention
  - Emergency Response
- Spills
- Fire
- Injury
- Accident (Vehicle, Forklift, AWP, Pedestrian, etc)
  - Fire Safety Plan
  - Water Pollution
- BMPs
- Storm Drain Discharge Permits
- Dry dock cleanliness
- Shipboard discharges
  - Air Pollution control and Reporting
- VOCs
- Fuel Usage
- Weld Rod Usage
- Neshap violations
- O&M Plans
- Permits
- Placards (Equipment Registration)
- Best Available Control Technology (BACT)
- Abrasive Blasting
- Negative Ventilation

- Hot Work / Fire Protection
- MHE
- Motor Vehicles and Bicycles
- OSHA and VPP
- Injury Reporting
- Noise

When a Project enters the shipyard for an availability, an ESH manager is assigned to the project team. The ESH manager is the initial point of contact for any ESH related problems or questions that arise regarding shipyard, ships force, contractor or any problems with, or observed by, project team employees. However, if any questions or problems involve the terms or conditions of the contract, the scope of work set forth in the contract, or other matters of contractor performance the ESH Representative will direct all inquiries to the contracting organization's COR. The following is a general flow chart of an active project showing where the ESH manager is aligned.



To ensure contractors follow our specific permit requirement, a local standard item is invoked into their contract. The contractor is required to incorporate all of the requirements in the local standard item into their work processes. The ESH manager uses this document during inspections to ensure contract compliance. The following is the General Contractor Water Pollution and spill prevention local standard item

CONTRACTOR WATER POLLUTION PREVENTION

NORTHWEST REGIONAL MAINTENANCE CENTER

LOCAL STANDARD ITEM

FY-08
ITEM NO:
DATE:
CATEGORY:

1.0 SCOPE:

1.1 Title:General Contractor Water Pollution and spill prevention Requirements for Bremerton Naval Complex (BNC)

2.0 REFERENCES:

2.1 NAVSEA STANDARD ITEMS

2.2 Local Standard Items

2.3 Puget Sound Naval Shipyard's National Pollutant Discharge Elimination System Permit WA-000206-2

2.4 Puget Sound Naval Shipyard's State Waste Discharge Permit ST-7374

2.5 40 CFR, Part 403, General Pretreatment Regulations for Existing and New Sources of Pollution

2.6 40 CFR, Part 122, EPA Administered Programs: The National Pollutant Discharge Elimination System

2.7 WAC 173-216, Washington State Waste Discharge Permit Program

3.0 REQUIREMENTS:

3.1 Comply with the applicable requirements of Reference 2.1, 2.2, 2.3, 2.4, 2.5, and 2.6

3.2 Water Pollution Control

3.2.1 In no event shall waste or any other material be disposed of in the storm sewer system. This system is normally indicated with a metal fish tag stating "DO NOT DISCHARGE - - DRAINS TO BAY". Discharge to a sanitary sewer drain (e.g., sinks & toilets) is prohibited unless prior authorization has been obtained.

3.2.2 Contractors shall identify potential sources of pollution, which may reasonably be expected to affect the quality of storm water discharge from the site and select from the list of mandatory Best Management Practices (BMPs). If the applicable BMPs are not effective in preventing the discharge of pollutants, then select and implement additional BMPs from EPA 832-R-92-005 and Washington State Department of Ecology, Storm water Management Manual for Western Washington.

3.2.3 Water Pollution Prevention Practices. Pamphlets entitled WATER POLLUTION PREVENTION PRACTICES (BMPS) and Contractor's Guide to Environmental Compliance, NAVSHIPYDPUGET P5090 (4) are available from the Supervisor upon request. The pamphlet and guide will help explain what types of practices need to be identified and utilized for contractor activities. Pollution prevention practices include but are not limited to:

3.2.1.1 Restrict vehicle and equipment fueling operations to designated areas as specified. Provide these designated areas with measures that prevent contamination of storm water runoff.

3.2.1.2 Vehicle and equipment cleaning, maintenance, and awaiting maintenance areas are prohibited, unless otherwise approved by the Supervisor, in conjunction with Code 106.3.

3.2.1.3 Contractor work sites shall be kept clean to minimize loss of accumulated debris when it rains. Clean up as necessary to maintain control of potential pollutants.

3.2.1.4 Implement additional preventative measures required to minimize the potential of any spill event, such as using tarps, drip pans, and proper storage.

3.2.4 Provide and position floats or tarps adjacent to an over-water work area to contain debris. No debris or overspray shall enter the surface waters.

3.2.5 Implement provisions to keep overspray from paint operations from going to the dry dock floor or outside the painting area.

3.2.6 Notify the Supervisor 7 days prior to discharge of approved wastewater to be discharged to the sanitary sewer in quantities greater than 1000 gallons per day. Otherwise, notify the Supervisor 24 hours in advance.

3.2.7 Disinfection water is to be discharged to the sanitary sewer only when chlorine concentration is less than 100 ppm. For discharge of volume greater than 3000 gallons a day, notify the Supervisor 7 working days prior to discharge. Otherwise, notify the Supervisor 24 hours in advance.

3.2.8 Allowing non-approved discharges may result in a direct violation of regulations and/or permits issued by Environmental Protection Agency (EPA), or the Washington Department of Ecology (WDOE).

3.2.9 **Pressure washing and hydroblasting requirements (>150 psig)**

3.2.9.1 The contractor must meet with the Supervisor, Shop 99, and Code 106.32 and Project ESH Manager to work out a plan to collect pressure washing/hydroblasting wastewater. This plan must be submitted for approval by Code 106.32 and Shop 99 via the Supervisor. (Note: The contractor must cease all pressure washing /hydroblasting operations and clean the cofferdam when the treatment system is overwhelmed due to heavy rainfall or when the treatment system stops operating.)

3.2.9.2 All water from hull pressure washing (>150 psig) and ultra high-pressure hydro-blasting must be collected for treatment. This includes run-off from these operations as well as any precipitation occurring during the operations.

3.2.9.3 Marine growth and paint chips removed by the washing and blasting operations will be separated from the water and each other to the maximum extent feasible, managed and disposed as follows:

3.2.9.3.1 Marine growth shall be double bagged and labeled "sea growth" and placed in solid waste containers prior to the end of each shift.

3.2.9.3.2 Paint chips and any other waste shall be cleaned up and removed from the dry dock each work shift. Paint debris shall be dewatered. It shall be collected and managed per reference 2.2 (until Government waste designation is complete) and placed in Contractor operated accumulation area prior to the end of each shift.

3.2.9.4 Provide collection system(s) for hull pressure wash and hydro-blast which are sized to handle wash water, all precipitation (rain/snow) falling in the portion of the dry dock used to collect waste water, and background flows (such as water from service galleries, and rain water from areas around the dry dock). The contractor shall provide the collection system and document that the system is appropriately sized.

3.2.9.5 Provide a means to keep waste from the hydro-blast operations out of the dock's service galleries, stairways, and any part of the dry dock where water drains directly to the bay.

3.2.9.6 Inspect all aspects of the containment system daily to ensure paint and waste waster is not being discharged outside the containment system.

3.2.9.7 In the event of a pumping system failure or leak of the primary collection system, work must stop until the pump system or collection system is repaired.

3.3 Initial Hull Wash Requirements (<150 psig)

3.3.1 Contractor specifications that require an initial hull wash (at pressures less than 150 psi, without detergent, brushes, brooms, scrappers, etc.) to remove salt and marine growth immediately following dry docking is allowed. If possible, the PWCS should be in Bay/Sewer/Tank mode during the hull wash. Contact Code 106.32 for direction.

3.3.2 The wash must be performed as soon as possible after docking. Contact the project Environment, Safety, and Health (ESH) Manager via the Supervisor for inspection of the hull for flaking paint. Flaking paints shall be captured separately from the sea growth waste and disposed of as hazardous waste via the WIS process. Sea growth shall be doubled bagged, marked with the word "Sea Growth" and disposed of in a regular trash dumpster.

3.4 Waste Water Pretreatment

3.4.1 Waste water generated by contractors shall have a contractor originated WIS for each unique type of wastewater generated.

3.4.2 In no event shall waste or any other material be disposed of, or be allowed to enter into dry dock drainage system, Sinclair Inlet, sanitary sewer system, or the storm sewer system without the express permission of the Supervisor.

3.4.3 Discharge to a sanitary sewer drain (e.g., sinks & toilets) is prohibited unless prior authorization has been obtained (via the Waste Information Sheet per reference 2.2). Allowing non-approved discharges may result in a violation of regulations and/or permits issued by the Environmental Protection Agency (EPA), or the Washington Department of Ecology (WDOE).

3.4.4 Known uncontaminated water may be discharged to the storm sewer by obtaining approval through submission of the form "Code 106.3 Storm Drain/Sanitary Sewer Discharge Approval. Submit the form to PSNS & IMF, Code 106.32 or fax it to (360) 476-8550 via the Supervisor.

3.4.5 Contractor generated shipboard liquid waste (e.g., liquids resulting from draining, cleaning, flushing, testing systems on naval vessels) disposal generally do not need a WIS, unless it has to be collected for treatment at PSNS & IMF's Industrial Wastewater Pretreatment Facility (IWPF) or disposed of as hazardous waste. Contractors shall contact the the Supervisor or the project ESH manager (secondary) for guidance to determine the disposition of shipboard wastewater. The Supervisor or the project ESH manager shall complete the Wastewater Disposal Report and submit it to Code 106.32 for approval and/or recordkeeping.

3.4.6 Liquid waste water generated from hull preservation work contains high levels of copper. If waste water is expected, contact the Project ESH Manager via Code 400 ESH to set up a pre-

planning meeting. At the pre-planning meeting there will be discussion of usage of the Dry Dock Process Water Collection System for routing waste water to sanitary sewer, or treatment, based on how contaminated it is.

3.4.7 Contractor personnel shall ensure dry dock drainage channels and sand traps remain clear of equipment and material such that flow is not restricted.

3.5 Spill Prevention

3.5.1 Contractor personnel shall be aware and understand spill prevention, spill events, and proper response for each type of event. The PSNS & IMF Emergency Spill Procedures Poster shall be posted at the work site or otherwise immediately available for employees.

3.5.2 Contractor personnel shall be aware that a spill is any un-permitted or uncontrolled release of oil or a hazardous substance to the water or ground or ship systems such as bilge water, or CHT, etc. This includes any spilling, leaking, pumping, emitting, discharging, injecting, escaping, leaching, disposing, or dumping of liquid or solid material not authorized by the contract.

3.5.3 Contractors shall take all reasonable and necessary precautions to prevent Oil and Hazardous Substances (OHS) from reaching the air, ground, or waterway. Reasonable steps, at a minimum, shall include:

3.5.3.1 Place a spill response kit at or near hazardous material and dangerous waste handling and transferring work sites.

3.5.3.2 Post a list of the materials for the spill kit.

3.5.3.3 Place oil and hazardous substances (OHS) in approved containers.

3.5.3.4 Inspect containers to ensure integrity prior to the transfer of material and storage of oil and hazardous substances.

3.5.3.5 Secure all containers (i.e., drum covers on) when not in use.

3.5.3.6 Store all containers in approved lockers or facilities which are maintained in a clean and orderly manner.

3.5.3.7 Secure or empty all containers prior to transportation.

3.5.3.8 Protect storm drains, catch basins, manholes, and floor drains within 50 feet of OHS operations with a mat, plug or other suitable device to prevent flow into subsurface distribution systems.

3.5.4 For contractors OHS equipment: All OHS containers with a capacity of 55 gallons or more must be located in an impermeable secondary containment. The containment must be capable of containing 100 percent of the largest container in the containment or 10 percent of the total volume of all containers, which ever is greater. Where possible, cover the containment to prevent the accumulation of rainwater. If secondary containment is not protected from rain, provide additional capacity for 4 inches of rain.

3.5.4.1 For known, uncontaminated rainwater that does accumulate, follow waste water requirements Paragraph 3.4.4 for discharge.

3.5.4.2 For contaminated rainwater, follow hazardous waste requirements of Paragraph 3.41 and Reference 2.2.

3.5.5 Transfer of OHS over water shall not be considered routine.

3.5.6 Oil and fuel transfer evolutions are subject to the requirements of 33 CFR Parts 154 and 156.

3.5.7 Tank cleaning effluent and bilge water are considered "oil" and the subsequent transfer of this material is considered an oil transfer evolution.

3.5.8 Oily wastewater, fueling, defueling, and internal fuel transfer evolutions should only be accomplished when operationally necessary.

3.5.9 Provide a qualified Person in Charge (PIC) at both the transfer and receiving points, to supervise transfer operations

3.5.10 Tank and bilge cleaning transfer operations require a Coast Guard approved Operations/Mobile Transfer Manual, per 33 CFR Part 154.100. In addition, current hose testing records that meet the requirements of 33 CFR Part 154.500 and documentation that transfer personnel are qualified as PICs per 33 CFR Part 154.710, are required.

3.5.11 Notify PSNS & IMF Shop 99 and Code 106.33 via the Supervisor, at least three days in advance of any OHS transfer.

3.5.12 The contractor must schedule and conduct an Operational Risk Management (ORM) meeting prior to all petroleum transfer operations (diesel, JP-5, lube oil, hydraulic oil, etc.). The ORM meeting is to ensure proper spill mitigation and response measures are in place. Attendance shall include the Supervisor, PSNS & IMF Shop 99 and Code 106.33, the Fire Department and, for ships under overhaul availability, the appropriate project personnel, Temporary Services Zone Manager or Ship Safety Officer/Ship Safety Supervisor (SSO/SS).

3.5.13 For homeport ships, the Homeport Office shall attend. The NBK CDO (for home ported ships) must be notified of all ORM meetings and transfer schedules but is not required to attend.

3.5.14 The contractor may conduct a pre-transfer brief among all parties to the transfer, in lieu of an ORM meeting, for oily wastewater transfers. Items to be discussed, during the pre-transfer brief, include but are not limited to: type and quantity of product to be transferred; communications; emergency procedures; and roles and responsibilities for all personnel involved in the transfer. Attendance shall include Shop 99, and contractor personnel.

3.5.15 For ships under overhaul availability, the project ESH manager is an optional attendee.

3.5.16 OHS transfer operations are generally prohibited between sunset and sunrise. Should a nighttime transfer be required, the contractor must request written permission from the Supervisor. The Supervisor must obtain permission, with 24-hour notification, from Commander Navy Region Northwest via PSNS & IMF Code 106.33.

3.5.17 A spill event is any un-permitted or uncontrolled release of oil or a hazardous substance to the water or ground. This includes any spilling, leaking, pumping, emitting, discharging, injecting, escaping, leaching, disposing, or dumping of liquid or solid material not authorized by the Contract.

3.5.18 There are two types of spill events, emergency and non-emergency.

3.5.19 Emergency spills are defined as follows:

3.5.19.1 Is an immediate threat to human health or the environment, or

3.5.19.2 Is a material not known to the person discovering the spill, or

3.5.19.3 Has the immediate potential to enter or has entered a drain or waterway or sanitary sewer man way, or migrate off government property, or

3.5.19.4 Requires assistance from the Government for cleanup, or

3.5.19.5 Is more than 10 gallons.

3.5.19.6 Emergency Spill Response Procedures. The following applies to spills resulting from work being performed or equipment being provided by Government contractors in the performance of their current contract.

3.5.19.6.1 In the event of an emergency spill, the contractor shall immediately notify the BNC Regional Dispatch Center (RDC) by calling 911 on BNC phone, or (360) 476-3333 on a non-BNC or cellular phone.

3.5.19.6.2 The contractor shall isolate the spill area and stay upwind until arrival of the BNC clean up crew.

3.5.19.6.3 If the contractor knows the properties of the spilled material, they shall, providing it can be done without endangering the safety or health of the contractor or other personnel, try to stop the spill and/or contain the spill to prevent it from going into drains or waterways

3.5.19.6.4 The Contractor shall notify the Supervisor and follow incident commander verbal instructions.

3.5.19.6.5 The Government will respond to all emergency spills.

3.5.19.6.6 The Contractor may be requested to assist the Government clean-up crew. All available technical data (e.g., MSDSs and waste profiles) the contractor possesses on the material spilled shall be provided upon request to emergency response personnel.

3.5.19.6.7 The contractor shall assist Shipyard personnel in preparing a spill report as requested

3.5.20 The Supervisor shall be provided with all relevant data necessary to determine financial impact and liability of the spill and reimbursement for assistance of spill clean-up and disposal services.

3.5.21 In the event of a non-emergency spill, the contractor shall stop the source of the spill, contain the spilled material and keep it away from drains or waterways. Block any drains near the spill if there is a chance the spill will reach them.

3.5.22 Contractor personnel shall wear the proper personal protective equipment while cleaning up a spill.

3.5.23 Waste debris shall be turned over to the Government accumulation area operator as waste awaiting designation (WAD) per Reference 2.2.

3.5.24 Non-emergency Spill Event.

3.5.24.1 A non-emergency spill event is anything not specified as an emergency spill event

4.0 NOTES:

4.1 Local Standard Item Requirements apply to prime contractors and their subcontractors.

4.2 The Supervisor will consult with PSNS & IMF, Code 106 for clarification of any requirements specified in this local standard item.

4.3 Enclosures

4.3.1 Shipyard BMPs

DRY DOCK INSPECTIONS

The environmental division Storm Water program manager performs formal Monthly Dry Dock Cleanliness inspections. These inspections are performed during active industrial activities within the dock. Project management accompanies the Storm Water manager during the inspections, and notes all discrepancies found. Most cleanliness findings are corrected on the spot, while others are sent to the project personnel and if necessary, to senior management for resolution. Discrepancies are inputted into a database for record keeping.

Code 106.32 performs Dry dock inspections monthly and prior to flooding in accordance with the Water Pollution Prevention and Control Plan NAVSHIPYDPUGETINST P5090.30A.

Environmental Safety and Health (ESH) and Zone Managers responsible for dry dock cleanliness accompany Code 106.32 during the inspections. Identified discrepancies are recorded and summarized in the Monthly Dry Dock Report. This report is sent to the Project Superintendents, Zone Managers and ESH Managers. Responsible parties are required to correct discrepancies as soon as possible. Code 106.32 follows up to ensure corrective actions have been accomplished.

Dry docks are evaluated for the following criteria:

- Good housekeeping methods
- Blasting debris controlled & cleaned up
- Skip boxes not leaking & contents identified
- Hazardous substances controlled
- Equipment properly maintained
- Control & clean-up of spills, drips & leaks
- Control of process waste
- Contaminants not discharged to dry dock drains

Example

All six (6) dry docks were inspected monthly during the second quarter of 2008 (18 inspections total). The charts below depict the results of these inspections:

DD1	APR	MAY	JUNE
Clean General Appearance / Housekeeping	SAT	SAT	SAT
Blast Containments not leaking	NA	NA	NA
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	SAT
Oil & Hazardous Substances (OHS) Controlled	NA	NA	NA
Properly Maintained Equipment	SAT	SAT	SAT
Control and Cleanup of Spills, Drips, and Leaks	NA	NA	NA
Stored Process Waste Not Exposed to Storm Water	SAT	SAT	SAT
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	SAT	SAT

DD2	APR	MAY	JUNE
Clean General Appearance / Housekeeping	SAT	UNSAT	SAT
Blast Containments not leaking	SAT	UNSAT	NA
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	SAT
Oil & Hazardous Substances (OHS) Controlled	SAT	SAT	NA
Properly Maintained Equipment	SAT	SAT	NA
Control and Cleanup of Spills, Drips, and Leaks	NA	NA	NA
Stored Process Waste Not Exposed to Storm Water	SAT	SAT	NA
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	UNSAT	SAT

DD3	APR	MAY	JUNE
Clean General Appearance / Housekeeping	SAT	SAT	SAT
Blast Containments not leaking	NA	NA	NA
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	SAT
Oil & Hazardous Substances (OHS) Controlled	NA	NA	NA
Properly Maintained Equipment	SAT	SAT	SAT
Control and Cleanup of Spills, Drips, and Leaks	NA	NA	NA
Stored Process Waste Not Exposed to Storm Water	SAT	SAT	SAT
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	SAT	SAT

DD4	APR	MAY	JUNE
Clean General Appearance / Housekeeping	NI	SAT	SAT
Blast Containments not leaking	NA	NA	NA
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	SAT
Oil & Hazardous Substances (OHS) Controlled	NA	NA	NA
Properly Maintained Equipment	SAT	SAT	SAT
Control and Cleanup of Spills, Drips, and Leaks	SAT	NA	NA
Stored Process Waste Not Exposed to Storm Water	SAT	SAT	SAT
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	SAT	SAT

DD5	APR	MAY	JUNE
Clean General Appearance / Housekeeping	SAT	SAT	UNSAT
Blast Containments not leaking	SAT	SAT	SAT
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	NI
Oil & Hazardous Substances (OHS) Controlled	NA	NA	NA
Properly Maintained Equipment	SAT	SAT	SAT
Control and Cleanup of Spills, Drips, and Leaks	NA	NA	NA
Stored Process Waste Not Exposed to Storm Water	SAT	SAT	SAT
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	SAT	SAT

DD6	APR	MAY	JUNE
Clean General Appearance / Housekeeping	SAT	SAT	SAT
Blast Containments not leaking	NA	NA	NA
Dry Dock Drain Troughs Not Obstructed with Debris	SAT	SAT	SAT
Oil & Hazardous Substances (OHS) Controlled	NA	NA	NA
Properly Maintained Equipment	NA	NA	NA
Control and Cleanup of Spills, Drips, and Leaks	NA	NA	NA
Stored Process Waste Not Exposed to Storm Water	NA	NA	NA
There is no potential of contaminates being Discharged into the Dry Dock Drains	SAT	SAT	SAT

DRY DOCK and STORMWATER INSPECTIONS

The PSNS&IMF Code 106 Stormwater Manager performs Pre-flood inspections. Pre-flood cleaning is accomplished using an assigned cleaning team. The cleaning team follows a guidance document (IEI 248.37) that outlines the cleaning process. Once the dry dock meets the standards of the cleaning document, the Stormwater manager is contacted to perform the final cleaning inspection. There is a signature block for the environmental division in the Pre requisite list for flooding the dry dock. Flooding cannot commence until the environmental representative signs this document.

DRY DOCK PRE-FLOOD INSPECTION

GENERAL REQUIREMENTS

The Bremerton Naval Complex (BNC) National Pollutant Discharge Elimination System (NPDES) Permit requires development and implementation of a Best Management Practices (BMP) Plan. Our BMP plan resides in NAVSHIPYDPUGETINST P5090.30A and requires the inspection of our dry docks for cleanliness prior to flooding. The criteria listed on form PSNS 5090/49 is used to determine dry dock cleanliness prior to flooding. Flooding cannot commence until all inspection criteria are met.

CLEANLINESS RESPONSIBILITY

The Project Superintendent (when a ship is in dry dock) or the Pier and Dock Master (when no ship is in dry dock) is ultimately responsible for dry dock cleanliness and shall review the status on a weekly basis and organize cleanups, as necessary.

WORKSITE DAILY CLEANUP

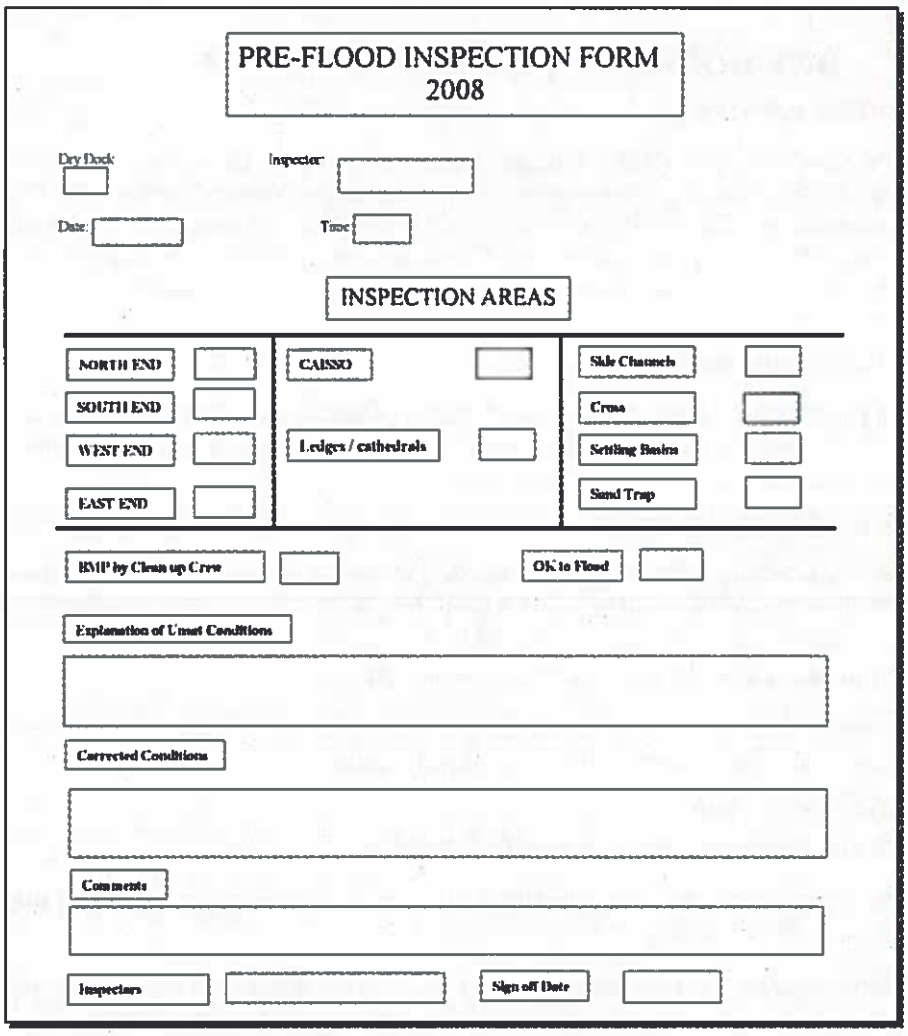
When dirt, surplus materials, solid waste, and dropped materials are allowed to accumulate on the dry dock floor, these materials could be washed away into the dry dock drainage system and discharge into Sinclair inlet. To minimize this BMP 2 should be used.

- Clean your work area by the end of each work shift.
- Inspect your work and storage areas daily for cleanliness. Cleanup work areas as necessary to maintain control of potential pollutants.

PRE-FLOOD INSPECTION

- Shop 90 cleaners clean the dock per IEI 248.37.
- Shop 90 supervisor contacts Code 106.32 if there is a need to deviate from the cleaning procedures of IEI 248.37.
- Code 106 performs the pre-flood dry dock inspection the day of the flooding with the Shop 90 supervisor and Project Environmental Safety and Health (ESH) representative for pre-flood cleanliness approval. Code 106 uses the form located on the following page to document to the inspection.
- When cleanliness of the Dry Dock is Satisfactory
  - Code 106 signs the Code 340 prerequisite list (PRL)
  - The flooding of the dock can commence.
- When cleanliness of the Dry Dock is Unsatisfactory

- The docking officer and project superintendent will be given a copy of the Dry Dock Inspection report which includes all pre-flood dry dock inspection discrepancies.
- Dry dock flooding cannot commence until the discrepancies are corrected.
- Code 106 signs the Code 340 PRL when all discrepancies are corrected.
- The flooding of the dock can commence.



Dry Dock Pre-Flood Inspection Form

STORMWATER INSPECTION PLAN

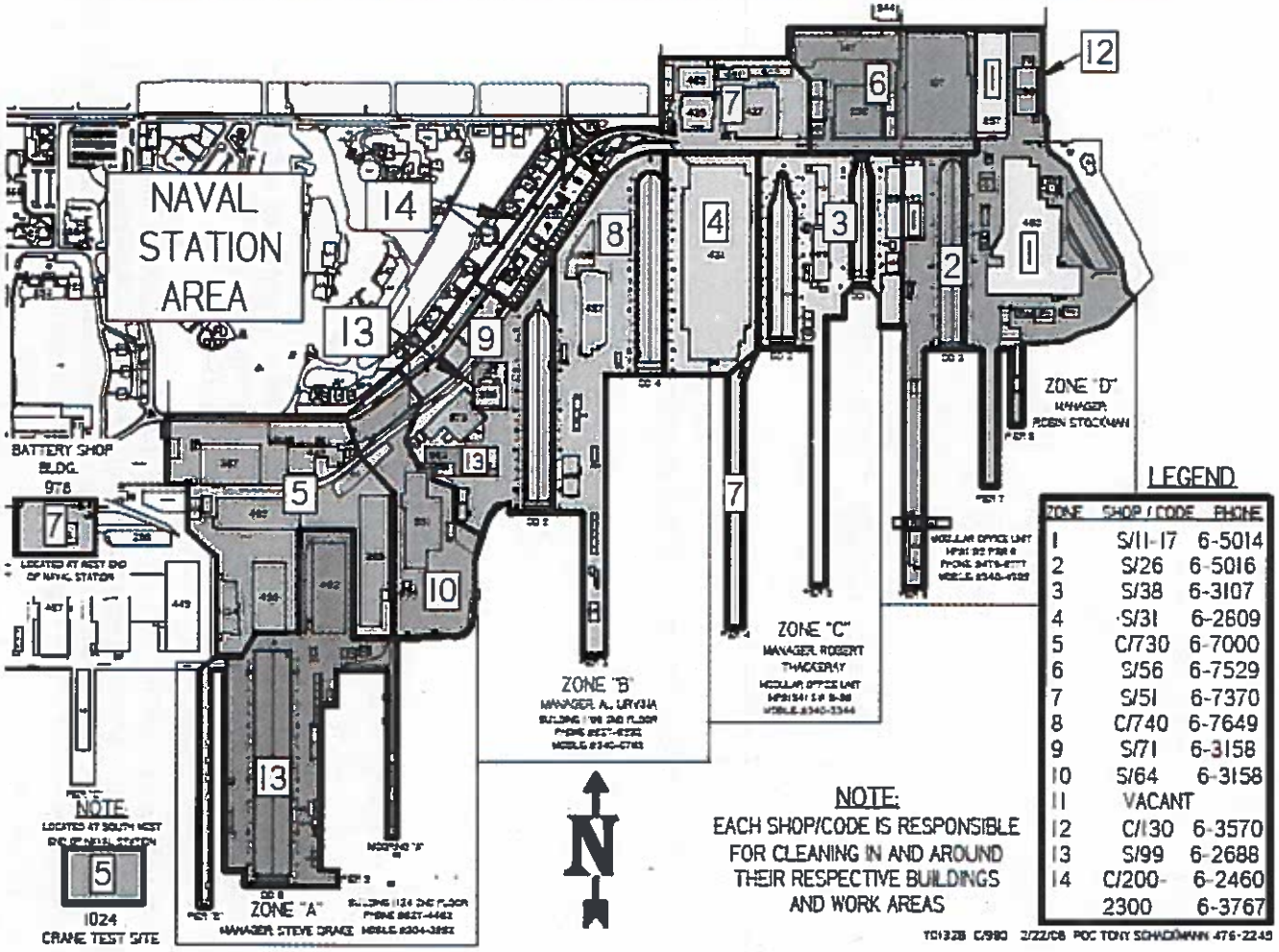
The purpose of the storm water inspections is to identify potential sources of pollution, and adherence to the requirements of the NPDES permit within the Bremerton Naval Complex, for the prevention of any adverse affect to the quality of storm water discharged into Sinclair Inlet.

The stormwater inspections for the BNC are carried out in several different ways.

1. Inspection of storm water zones.
   a. The BNC is divided into nine storm water zones. Each zone is inspected at lest once a quarter. The inspections encompass
   b. Storm drains around buildings, storm drain catchments, trash and debris, areas that may produce liquid into the storm drain system, preventative measures and spill kits.
2. Vehicle Maintenance areas that perform mechanical repair operations on equipment. These areas are inspected at least once a month for petroleum products leaking onto the ground, control of spills, drips, leaks, storm drain catchments protected, spill kits, trash and debris. Insurance that the storm drain system is not nor will be impacted by the activities in the area.
3. High Risk Outdoor work areas that have the potential to impact the storm water drainage system. These areas are inspected at least once a month to make sure any products produced by the activities in the area, do not have the possibility to impact the storm drain system. Inspection includes cleanliness, control of debris, and storm drains in area protected from products of the activities.

Inspections also include informational sessions with personnel at various facilities and locations on the Best Management Practices for NPDES compliance within the BNC.

SHIPYARD SAFETY INSPECTION AND CLEANLINESS ZONE ASSIGNMENTS

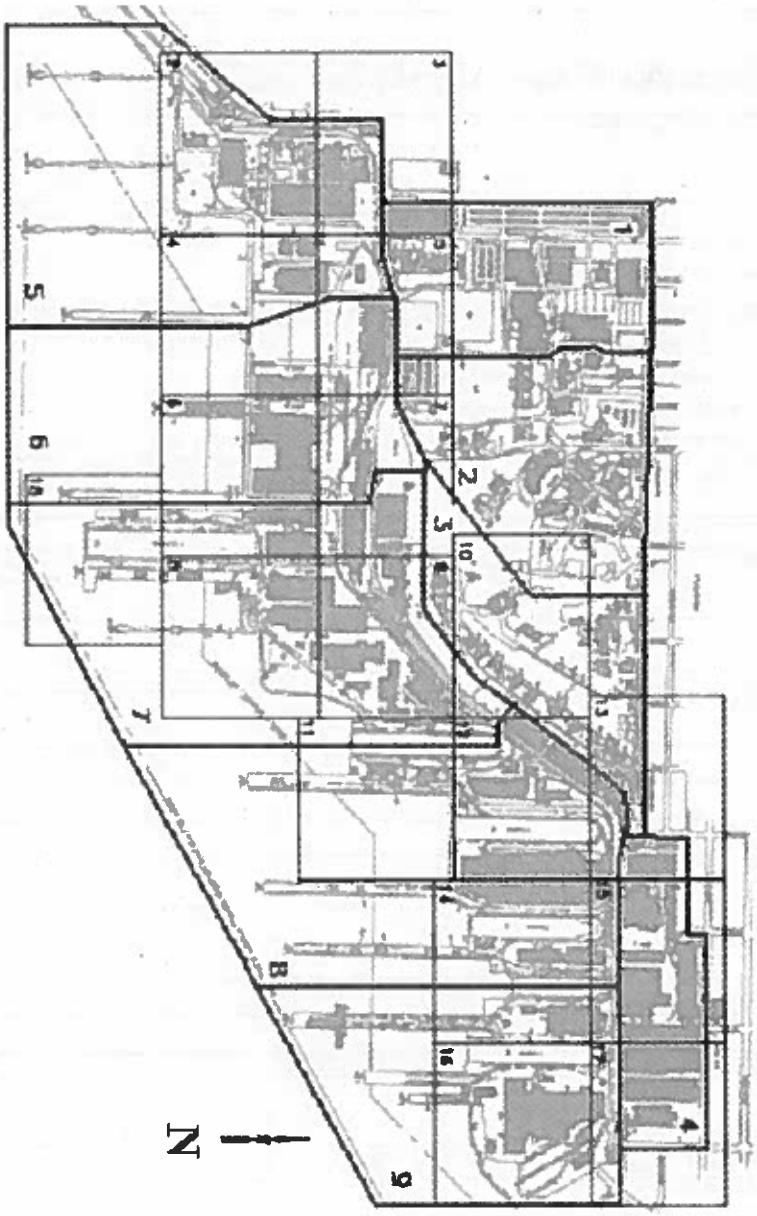


LEGEND

ZONE	SHOP / CODE	PHONE
1	S/11-17	6-5014
2	S/26	6-5016
3	S/38	6-3107
4	S/31	6-2609
5	C/730	6-7000
6	S/56	6-7529
7	S/51	6-7370
8	C/740	6-7649
9	S/71	6-3158
10	S/64	6-3158
11	VACANT	
12	C/130	6-3570
13	S/99	6-2688
14	C/200-2300	6-2460 6-3767

NOTE:
EACH SHOP/CODE IS RESPONSIBLE FOR CLEANING IN AND AROUND THEIR RESPECTIVE BUILDINGS AND WORK AREAS

TD1328 C/980 2/22/08 POC TONY SCHACKMANN 476-2245



STORM WATER INSPECTION ZONES

CODE 106.32 STORM DRAIN DISCHARGE APPROVAL FORM

CODE 106.32 STORM DRAIN / SANITARY SEWER DISCHARGE APPROVAL

NAVSHIPYDPUGETINST P5090.30

REQUEST SUBMITTED BY (Please Print Name)	CODE or Organization:	
	Phone:	Fax:

Submit this form to Code 106.32 for discharge approval (indicate discharge to be made):

- ☐ FIRE HYDRANT FLUSHING
- ☐ POTABLE WATER SYSTEMS, INCLUDING PIPELINE FLUSHING
- ☐ ROUTINE EXTERNAL BUILDING WASHDOWNS THAT DO NOT USE DETERGENTS OR OTHER COMPOUNDS
- ☐ UNCONTAMINATED RAINWATER FROM BERMED AREAS
- ☐ UNCONTAMINATED RAINWATER FROM UTILITY VAULTS
- ☐ NON CONTACT COOLING WATER FROM TEMPORARY EQUIPMENT
- ☐ PAVEMENT AND PIER WASHDOWNS WHERE DETERGENTS OR OTHER ADDITIVES ARE NOT USED, AND WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED (UNLESS ALL SPILLED MATERIALS HAVE BEEN REMOVED AND MANUAL (BROOM, SWEEPER) CLEANING OCCURS PRIOR TO WASHDOWN).

PLEASE PROVIDE THE FOLLOWING INFORMATION:

DATE AND TIME OF DISCHARGE:	LOCATION (BUILDING #, PIER, ETC)	FISH LABEL #: (If available)

VOLUME of DISCHARGE:	TEMPERATURE OF WATER:
_____ GALLONS	_____ °F

WHAT ADDITIVES WERE INTRODUCED OR COULD HAVE ENTERED THE WATER?

_____

_____

_____

DESCRIPTION OF THE WATER (QUALITY) AND WHAT IT WAS USED FOR:

_____

_____

_____

_____

CODE 106.32 APPROVAL OF THE WATER DISCHARGE DESCRIBED ABOVE:

NAME	DATE
☐ STORM DRAIN ☐ SANITARY SEWER	

IF APPROVAL IS NOT GIVEN, PROVIDE EXPLANATION:

_____

_____

_____

_____

PSNS&IMF 5090/110 (Rev. 3-05)

Attachment 6: Working Draft Permit BMPs

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study

Table A6-1: Working Draft Permit BMPs

WDP Permit Reference	BMP
II.C	**Stormwater Controls, Inspections, and Evaluations**
II.C.2.a)	**Prevent Exposure.** The permittee must, to the extent achievable, either locate industrial materials and activities inside, or protect them with storm-resistant coverings in order to prevent exposure to rain, snow, snowmelt and runoff.
II.C.2.b)	**Good Housekeeping**
II.C.2.b) (1)	**General Cleanup**
II.C.2.b) (1)(a)	The permittee must keep clean all exposed areas that are potential sources of pollutants
II.C.2.b) (1)(b)	Any washwater must be directed to the sanitary sewer.
II.C.2.b)(1)(c)	Clean regularly all accessible work, service and storage areas to remove debris, spent sandblasting material, and any other potential pollutants.
II.C.2.b)(1)(d)	Implement a schedule for routine yard maintenance and cleanup. Clean trash, debris, and dirt from storage and work areas to prevent it from washing into the storm drains.
II.C.2.b)(1)(e)	Immediately repair or replace leaking connections, valves, pipes, hoses, and equipment that may cause contamination of stormwater.
II.C.2.b)(1)(f)	The industrial areas must be cleaned with sweeping and vacuuming frequently to minimize the possibility that stormwater runoff will carry sandblasting, grit or other debris into the receiving water. During wet weather, these areas must be cleaned daily. Vacuums must be equipped with appropriate filters that prevent the escape of the fume to the environment.
II.C.2.b)(2)	Waste materials. Implement a schedule for regular pickup and disposal of waste materials, along with routine inspections for leaks and conditions of drums, tanks and containers.
II.C.2.b)(3)	**Blasting and Painting Area.** Implement measures to prevent spent abrasives, paint chips, and overspray from discharging into Sinclair Inlet or the storm sewer system including the following measures:

Table A6-1: Working Draft Permit BMPs

WDP Permit Reference	BMP
II.C.2.b)(3)(a)	Enclose, cover, or contain all blasting and sanding activities to the maximum extent practicable to prevent abrasives, dust, and paint chips, from reaching storm sewers or Sinclair Inlet.
II.C.2.b)(3)(b)	Perform spray paint operations in a manner to contain overspray and spillage, and minimize emission of particulates.
II.C.2.b)(3)(c)	Perform all dry-blasting operation within an enclosure with adequate dust collection. Remove all spent blast grit within 72 hours.
II.C.2.b)(3)(d)	Prohibit all uncontained spray painting, blasting, or sanding activities over open water.
II.C.2.b)(3)(e)	Prohibit outside spray painting, blasting or sanding activities during windy conditions that render containment ineffective.
II.C.2.b)(3)(f)	Use fixed platforms with appropriate plastic or tarpaulin barriers as work surfaces and for containment when work is performed on a vessel in the water to prevent blast material or paint overspray from contacting stormwater of the receiving water. Use of such platforms will be kept to a minimum and at no time be used for extensive repair or construction (anything in excess of 25 percent of the surface area of the vessel above the waterline).
II.C.2.b)(3)(g)	Use plastic or tarpaulin barriers beneath the hull and between the hull and dry dock walls to contain and collect waste and spent materials.
II.C.2.b)(3)(h)	Clean and sweep frequently to remove debris, spent sandblasting material, and any other potential stormwater pollutants prior to exposure to rainfall and/or other sources of runoff.
II.C.2.b)(3)(i)	Clean paint operation work areas at the end of each work shift to prevent pollutant exposure to rainfall and/or other sources of run off. Cleaning should be accomplished using vacuums equipped with appropriate filters and/or other cleaning methods that prevent the escape of the overspray to the environment.
II.C.2.b)(3)(j)	Store spent abrasives under cover. Prevent any contact between process or stormwater and sandblast grit and spent abrasives.
II.C.2.b)(3)(k)	Spillage. Immediately clean up any spillage on areas that that have connection to stormwater system or directly to Sinclair Inlet.
II.C.2.b)(3)(l)	Consideration should also be given to feasible innovative procedures as appropriate to improve the effectiveness of controlling dust emissions and paint overspray.
II.C.2.b)(4)	**Material Storage Areas**. Implement measures to prevent or minimize the contamination of precipitation or surface runoff from the storage areas, including the following measures

Table A6-1: Working Draft Permit BMPs

WDP Permit Reference	BMP
II.C.2.b)(5)	**Engine Maintenance and Repair Areas.** Implement measures to prevent or minimize the contamination of precipitation or surface runoff from all areas used for engine maintenance and repair including the following measures:
II.C.2.b)(5)(c)	Minimize contaminants from these areas (e.g. drip pans under equipment, indoor storage, use of berms or dikes, or other equivalent measures.)
II.C.2.b)(5)(e)	Maintain an organized inventory of materials used in the shop.
II.C.2.b)(6)	**Material Handling Area.** Implement measures to prevent or minimize the contamination of precipitation or surface runoff from material handling operations and areas (e.g., fueling, paint and solvent mixing, disposal of process wastewater streams from vessels), including the following measures:
II.C.2.b)(6)(b)	Immediately repair, replace or isolate leaking connections, valves, pipes, and hoses, carrying wastewater, fuel, oil or other hazardous fluids.
II.C.2.b)(6)(c)	Mix paints and solvents in a designated area (preferably indoors or under a shed), under conditions such that no spill shall enter stormwater system or Sinclair Inlet. Use drip plans, drop cloths, tarpaulins and other protective devices in all paint mixing and solvent operations unless carried out in impervious contained and covered areas.
II.C.2.b)(7)	**Fueling Areas**
II.C.2.b)(7)(a)	Conduct fueling only in designated areas. Prohibit any mobile fueling.
II.C.2.b)(7)(b)	Design fueling islands to control spills (dead-end sump or spill control separator), and to divert collected stormwater to the sanitary sewer. Slope the concrete containment pad around the fueling island toward drains; either trench drains, catch basins and/or a dead-end sump.
II.C.2.b)(7)(c)	Design the fueling island as a spill containment pad with a sill or berm raised to prevent the runoff of spilled liquids and to prevent run-on of stormwater from the surrounding area.
II.C.2.b)(7)(d)	The fueling pad must be paved with Portland cement concrete, or equivalent. Asphalt is not considered an equivalent material. The fueling island must have a roof or canopy to prevent the direct entry of precipitation onto the spill containment pad. The roof or canopy should, at a minimum, cover the spill containment pad (within the grade break or fuel dispensing area) and preferably extend several additional feet to reduce the introduction of windblown rain. Convey all roof drains to storm drains outside the fueling containment area.
II.C.2.b)(7)(e)	Stormwater collected on the fuel island containment pad must be conveyed to a sanitary sewer system.
II.C.2.b)(8)	**Dry Dock Activities**
II.C.2.b)(8)(a)	Use sweeping and vacuums for general dry dock clean up.

Table A6-1: Working Draft Permit BMPs

WDP PermitReference	BMP
II.C.2.b)(8)(b)	Clean the dry dock at the end of each work shift.
II.C.2.b)(8)(c)	Thoroughly clean the dry dock prior to flooding. Cleaning must be accomplished with manual or mechanical sweeping with vacuuming to remove fine grit and debris.
II.C.2.b)(8)(d)	All dry dock floor drainage and stormwater must be collected and conveyed to the sanitary sewer in accordance with Part I.D.
II.C.2.b)(8)(e)	Any freeze protection water that contacts the dry dock floor must be conveyed to the sanitary sewer.
II.C.2.c)(1)	The permittee must regularly inspect, test, maintain, and repair all industrial equipment and systems to avoid situations that may result in leaks, spills, and other releases of pollutants in stormwater to receiving waters.
II.C.2.c)(2)	As part of the preventive maintenance program, perform timely inspection and maintenance of stormwater management devices (e.g., cleaning oil and water separators and sediment traps to ensure that spent abrasives, paint chips, and solids will be intercepted and retained prior to entering the storm drainage system), as well as inspecting and testing facility equipment and systems to uncover conditions that could cause breakdowns or failures resulting in discharges of pollutants to surface waters.
II.C.2.c)(3)	Prepare and implement a catch basin maintenance program.

Attachment 7: Proposed New and Revised BMPs

Puget Sound Naval Shipyard & Intermediate Maintenance Facility AKART Study

BMPs SPECIFIC TO DRY DOCKS

DD-BMP 1 DRY DOCK CLEANING

(1) Personnel working in the dry dock shall clean their work areas at the end of each shift. Cleaning shall include the collection of wood, plastic, paint chips, discarded construction materials, residual sandblast grit (if outside of a containment), grinding debris, paper, welding residue, ear plugs, cigarette butts, rags, , and insulation.

DD-BMP 2 PRE FLOOD CLEANING

(1) Pre flood cleaning shall follow the requirements of IEI 248.37 (Dry Dock Cleaning) instruction.

DD-BMP 3 POST FLOOD CLEANING

(1) Post flood cleaning shall follow the requirements of IEI 248.37 (Dry Dock Cleaning) instruction.

DD-BMP 4 MATERIAL STORAGE AND HANDLING

(1) Liquid Oil Hazardous Substance (OHS): Containers that hold liquid materials which have the potential of adding pollutants to water (e.g., fuels, paints, oil, antifreeze, batteries and solvents), shall be stored under cover. Containers shall be stored with tight fitting lids. Containers 55 gallons and greater that contain OHS liquid shall be stored under cover and inside a secondary containment.

(2) Waste-bins containing sandblast grit, metal shavings, used zinc anodes, welding debris, lead, copper wire, bronze, brass and material contaminated with petroleum products shall be covered.

(3) Conduct regular inspections so that leaks and spills are detected as soon as possible. Clean up all spills and leaks immediately.

DD-BMP 5 CONTAINMENT AND CONTROL OF DUST AND OVERSPRAY

(1) Copper antifouling paint activities that involve blasting, spray painting, sanding, welding, and grinding shall be in enclosed, covered areas.

(2) Rolling or brushing antifouling paint shall have tarps positioned underneath the area.

(3) Spray painting with products other than antifouling paints see NAVSHIPYDPUGETINST 5090.10C Air Pollution and Control Plan.

(4) Perform all dry blasting operation in an enclosure designed to keep dust and debris from contacting stormwater.

DD-BMP 6 DRIP PANS AND SECONDARY CONTAINMENT

(1) Use drip pans, secondary containment, or other protective devices at hose connections when transferring oil, fuel, solvent, industrial wastewater, and paint.

(2) Immediately repair, replace or isolate leaking connections, valves, pipes, hoses, carrying wastewater, fuel, oil, or other hazardous fluids.

DD-BMP 7 EQUIPMENT PREVENTIVE MAINTENANCE

(1) Leaks from equipment found in a dry dock shall be contained using a drip pan or absorbent.

(2) Leaking equipment shall be repaired by end of shift or removed from the dry dock.

DD-BMP 9 DISCHARGES INTO DRY DOCK DRAINAGE SYSTEM

(1) Unless authorized by Code 106.32 in accordance with NAVSHIPYDPUGETINST 5090.30A or IPI 0505-903, do not discharge anything to the dry dock floor or the dry dock drainage system.

(2) Operations which could spill significant materials (e.g., liquid hazardous materials, wastes, wastewater, and fuels) on the dry dock floor will utilize tarps, secondary containments or other protective device during the operation.

DD-BMP 10 OUTDOOR WORK OPERATIONS

(1) Mix paints and solvents in a designated area under conditions designed to prevent spills to the dry dock floor.

(2) Equipment and supplies must be on-hand for the control and clean up of liquid or debris spills. Examples of items you will need in a spill kit include drop cloths, absorbents, rubber mats, tape, tarps, brooms, or vacuums. Design your spill kit for the material being used.

DD-BMP 11 OUTDOOR METAL WORK

(1) Metal work areas must be constructed such as to prevent rainwater from contacting the work process and/or debris. The dry dock floor is not allowed to serve as the containment floor. C/106 can grant an exemption if the size of the work piece reasonably precludes conducting the work undercover.

(2) Metal work areas intended for use greater than one month must be completely enclosed.

(3) Exhaust vent used in a work area must be constructed such that the air from the containment does not exhaust outside unfiltered.

DD-BMP 12 COMMON TRASH RECEPTACLES

(1) Trash receptacles will be placed inside the dry dock to promote the proper disposal of common trash.

(2) Trash containers will be of the covered type.

(3) Trash containers equipped with drains shall be plugged.

<u>BMPs SPECIFIC TO AREAS OUTSIDE OF DRY DOCKS</u>

BMP 1 YARD CLEANUP

(1) Responsible shops, building managers, and cleanliness zone managers shall conduct weekly cleanliness inspections of outdoor areas. Remove all visible debris.

(2) Do not clean paved areas, equipment, buildings etc using wet methods (hosing down) without approval from Code 106.

BMP 2 MATERIAL STORAGE AND HANDLING

(1) Liquid Oil Hazardous Substance (OHS): Containers that hold liquid materials which have the potential of adding pollutants to water (e.g., fuels, paints, oil, antifreeze, batteries and solvents), shall be stored under cover away from drains. Containers shall be stored with tight fitting lids. Containers 55 gallons and greater that contain OHS liquid shall be stored under cover and inside secondary containment.

(2) Landscaping Supplies: Containers of granulated or liquid materials which have the potential of adding pollutants to water (e.g., fertilizer, pesticides, etc.) should be stored inside. Outside storage areas shall be under cover. Protect the material from stormwater contact.

(3) Construction and Industrial debris: Cover and contain the stockpiles of raw materials and debris (e.g. soil, deicers, sandblast grit etc.) The covers must be in place at all times when work with the stockpiles is not occurring.

(4) Cover zinc anodes, lead, copper wire, and material contaminated with petroleum products.

(5) Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible. Clean up all spills and leaks immediately.

BMP 3 CONTAINMENT AND CONTROL OF DUST AND OVERSPRAY

(1) Activities that generate pollutants, (e.g., blasting, painting, metal finishing, sanding, welding, grinding) shall be contained to prevent the discharge of these materials into Sinclair Inlet. Prevent spent blast grit, paint chips, and paint overspray from coming in contact with stormwater.

(2) Vacuum sanders shall be used when sanding outdoors.

(3) Perform spray paint operations within an enclosure to prevent overspray and spillage, and minimize emission of particulates.

(4) Perform dry-blasting operations within an enclosure.

BMP 4 DRIP PANS AND SECONDARY CONTAINMENT

(1) Use drip pans or other protective devices at hose connections when transferring oil, fuel, solvent, industrial wastewater, and paint. Where design constraints, vertical connections, or interferences do not allow placement of drip pans, use other measures, such as chemical resistant drapes. Immediately repair, replace or isolate leaking connections, valves, pipes, hoses, carrying wastewater, fuel, oil, or other hazardous fluids.

(2) Use drip pans or other protective devices when making and breaking connections, or during component removal operations.

BMP 5 VEHICLE/EQUIPMENT CLEANING

(1) Vehicles and equipment may only be washed in designated approved cleaning areas with liquid wastewaters recycled or routed to the sanitary sewer.

(2) Approved vehicle and equipment wash areas within the Bremerton Naval Complex are located at Building 455 and 1023.

BMP 6 VEHICLE AND EQUIPMENT PREVENTIVE MAINTENANCE

(1) Government vehicles and equipment must be checked for leaks before use. Vehicles and equipment must be maintained in good condition at all times. Inspect infrequently used vehicles and equipment for leaks routinely.

(2) Leaking vehicles awaiting maintenance shall be stored under cover or in an area designed with the proper structural controls that would prevent oil from entering the storm drain system.

(3) Vehicle maintenance shall be performed under cover.

BMP 7 MATERIAL LOADING/UNLOADING

(1) Place rubber mats over or a temporary berm around vulnerable storm drains when loading and unloading liquids and fine granulated materials from trucks and trailers at outdoor loading areas.,

(2) Loading and unloading areas shall have a stocked spill kit designed for the materials being loaded or unloaded close to the transfer site.

BMP 8 OVER-WATER PROTECTION

(1) Over-water work (such as but not limited to brush or roller painting, paint chipping, blasting, welding, grinding, cutting, chipping, and sanding) shall have containments such that no debris, can enter Sinclair Inlet. When windy conditions exist to prevent adequate containment of pollutants, stop work until conditions improve. Under no circumstance shall any debris enter Sinclair Inlet.

(2) Use fixed platforms with appropriate plastic or tarpaulin barriers as work surfaces and for containment of painting and hand paint-preparation when work is performed on a vessel in the water to prevent waste or paint from contacting the receiving water. Paint application is restricted to brushes and rollers unless the work is fully contained.

(3) Vacuum sander will be used when sanding outdoors.

(4) Follow the requirements of BMP 3 for Spray paint and dry blasting operations.

BMP 9 TREATED WOOD PRODUCTS

(1) Use FRX and pressure treated wood only where specifically required by Shipyard or higher level instructions.

(2) Store treated wood, under cover on pallets or indoors, when not in use.

BMP 10 DISCHARGES INTO STORM DRAINS

(1) Unless authorized by Code 106.32 in accordance with NAVSHIPYDPUGETINST 5090.30, do not discharge anything into the Bremerton Naval Complex storm drains.

BMP 11 OUTDOOR WORK OPERATIONS

(1) Mix paints and solvents in a designated area under conditions designed to prevent spill to the dry dock floor.

(2) Equipment and supplies must be on-hand for the control and clean up of liquid or debris spills. Examples of items you will need in a spill kit include drop cloths, absorbents, rubber mats, tape, tarps, brooms, or vacuums. Design your spill kit for the material being used.

BMP 12 OUTDOOR METAL WORK

(1) Metal work areas must be constructed such as to prevent rainwater from contacting the work process and/or debris. The dry dock floor is not allowed to serve as the containment floor. C/106 can grant an exemption if the size of the work piece reasonably precludes conducting the work undercover.

(2) Metal work areas intended for use greater than one month must be completely enclosed .

(3) Exhaust vent used in a work area must be constructed such that the air from the containment does not exhaust outside unfiltered.

BMP 13 COMMON TRASH RECEPTACLES

(1) Trash receptacles will be placed inside the dry dock to promote the proper disposal of common trash.

(2) Trash containers will be of the covered type.

(3) Trash containers equipped with drains shall be plugged.

(4) Trash containers shall be closed at all times, except when trash is being added

BMP 14 STORM SEWER SYSTEMS CLEANING

(1) Inspect catch basins and storm water treatment systems every six months.

(2) Clean catch basins and storm water treatment systems at minimum annually.

BMP 15 FUELING AREAS

(1) Mobile fueling outside of dry docks will be accomplished using procedures contained in NAVSHIPPUGET INST 5090.9, Spill Prevention Plan.

(2) Spill prevention methods will be implemented in the mobile fueling process (e.g. spill kit, absorbent pads, drip pans etc.).

(3) Portable fueling tanks are prohibited from fueling equipment outside of the dry docks.

Attachment 8: Cross Reference - WDP and Proposed BMPs

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study

Table A8-1: Cross Reference – Proposed New PSNS&IMF BMPs with those in the WDP

WDP Reference	NON DRY DOCK BMPs															DRY DOCK BMPs											NOTE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	
II.c.2.a		X																	X									
II.c.2.b(1)(a)	X															X												
II.c.2.b(1)(b)																												
II.c.2.b(1)(c)	X															X												
II.c.2.b(1)(d)	X																											
II.c.2.b(1)(e)				X																	X							
II.c.2.b(1)(f)											X					X												
II.c.2.b(2)	PSNS&IMF Instruction P5090.5																											See Note 'A'
II.c.2.b(3)			X					X												X								
II.c.2.b(3)(a)			X					X												X								
II.c.2.b(3)(b)			X					X												X								
II.c.2.b(3)(c)			X					X												X								
II.c.2.b(3)(d)			X					X																				
II.c.2.b(3)(e)			X					X																				
II.c.2.b(3)(f)								X																				
II.c.2.b(3)(g)																												PSNS&IMF recommends deleting this BMP. Using a tarp on the dry dock floor is often impractical and ineffective. Tarps are used for localized containment of debris; however, large tarps are a safety hazard and are relatively ineffective for containing paint overspray.
II.c.2.b(3)(h)	X															X												
II.c.2.b(3)(i)																	X											
II.c.2.b(3)(j)		X																	X									
II.c.2.b(3)(k)		X																	X									
II.c.2.b(3)(l)			X																	X								
II.c.2.b(4)		X																	X									
II.c.2.b(5)						X																X						
II.c.2.b(5)(c)				X		X															X	X						
II.c.2.b(5)(e)																												PSNS&IMF recommends deleting this BMP. Maintaining an inventory of shop material is not applicable to stormwater pollution prevention. Shop materials are stored indoors or inside of hazmat lockers. The Shipyard's hazardous material program sets the requirements for storage and tracking of materials.
II.c.2.b(6)											X														X			
II.c.2.b(6)(b)				X																	X							
II.c.2.b(6)(c)											X														X			
II.c.2.b(7)																												
II.c.2.b(7)(a)															X													
II.c.2.b(7)(b)																												Covered under the PSNS&IMF Oil and Hazardous Substance (OHS) Spill Prevention Plan.
II.c.2.b(7)(c)																												
II.c.2.b(7)(d)																												
II.c.2.b(7)(e)																												
II.c.2.b(8)																IEI 248.37												See note 'B'

Table A8-1: Cross Reference – Proposed New PSNS&IMF BMPs with those in the WDP

WDP Reference	NON DRY DOCK BMPs															DRY DOCK BMPs											NOTE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1	2	3	4	5	6	7	8	9	10	11	12	
II.c.2.b(8)(a)																X												
II.c.2.b(8)(b)																X												
II.c.2.b(8)(c)																	X											
II.c.2.b(8)(d)																								X				
II.c.2.b(8)(e)																Section 12 AKART Study												See note 'C'
II.c.2.c(1)																						X						
II.c.2.c(2)														X														
II.c.2.c(3)														X														
Outdoor Metal Work												X														X		
Dry Dock Cleaning																IEI 248.37												See note 'B'
Under Water Hull Cleaning	PSNS&IMF Instruction 5090.40A																											See note 'D'
Pre flood cleaning																	X											
Post Flood Cleaning																		X										
Trash Receptacles													X														X	
OHS				X																								

Note:

A: PSNS&IMF Instruction 5090.5, Waste Management Plan, is based on Washington Administrative Code (WAC) 173-303 and the Federal Resource Conservation and Recovery Act (RCRA). Appendix 'C' "Accumulation" The treatment of waste will be managed in either Satellite Accumulation Areas (SAA) or 45/90-day Accumulation Areas (AA). Containers of material waste stored at an SAA may accumulate up to 55 gallons. When this volume is reached, a start date must be entered on the label and the waste transferred, within 3 days of the start date, to an approved 45/90-day AA or Treatment, Storage, and Disposal Facility. All Satellite Accumulation Areas and 45/90 day areas are inspected on a weekly basis. A log of the inspection results are kept on site.

B: IEI 248.37 Bremerton Naval Complex, Dry Dock Cleaning Instruction, establishes the procedures and requirements for dry dock cleanliness for the various phases of the dry docks, (e.g. pre-flood, post-flood, post arrival, and project availability). The dry dock BMPs address particular requirements for individual operations occurring within the dry docks.

C: Section 12 of the AKART study addressed floor drainage and stormwater management within PSNS&IMF's dry dock drainage systems by analyzing the current management and control practices of water within the dry docks. The conclusion from the analysis was that the system and processes, which manage and control the water within the dry docks was found to be AKART.

D: PSNS&IMF Instruction 5090.40A is the instruction for "Removal of Sea Growth from Naval Vessels, Barges, and Other Fouled Marine Apparatus." Section 5 of the instruction addresses the "Requirements for Underwater Sea Growth Removal" which, includes inspection of the vessels by qualified personnel, evaluation to allow cleaning or not, inspection of the paint material that overlays the hull, the equipment that may be used, and the procedures that have to be followed for/during cleaning.

WDP – Working Draft NPDES Permit (EPA 2008)
IEI – Interface Engineering Instruction
OHS - Oil and Hazardous Substances

Attachment 9: Estimate of Stormwater Copper Loading

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study

Estimate of storm water copper loading from PSNS&IMF

The copper loadings from storm water discharges at PSNS&IMF were estimated using data and modeling results from Project ENVVEST studies. Flow data were simulated using a calibrated and verified Hydrologic Simulation Program Fortan (HSPF) model developed for the storm water drainage basins within the Shipyard (Figure 1, Skahill and LaHatte 2006, 2007). Copper concentrations of the storm water basins were estimated from empirical measurements of Cu concentrations measured in selected basins during storm events sampled between 4/19/2004 and 3/19/2005 (Table 1, Brandenberger et al. 2007a). The annual load was calculated as:

$$\text{Cu Load [kg/yr]} = \text{Flow} \times \text{Total Cu}$$

where:

$$\text{Flow} = \text{CFS } ft^3/s \times 28.32\ L/ft^3 \times 60s/min \times 60min/hr \times 24hr/day \times 365d/yr$$
$$\text{TotalCu} = \text{Cu ug/L} \times 1\ kg/10^9\ ug$$

The range was determined using the average, lower quartile (25th percentile), and upper quartile (75th percentile) of simulated yearly flow and the median, lower quartile (25th percentile), and upper quartile (75th percentile) estimated Cu concentration obtained from wet season sampling for each basin.

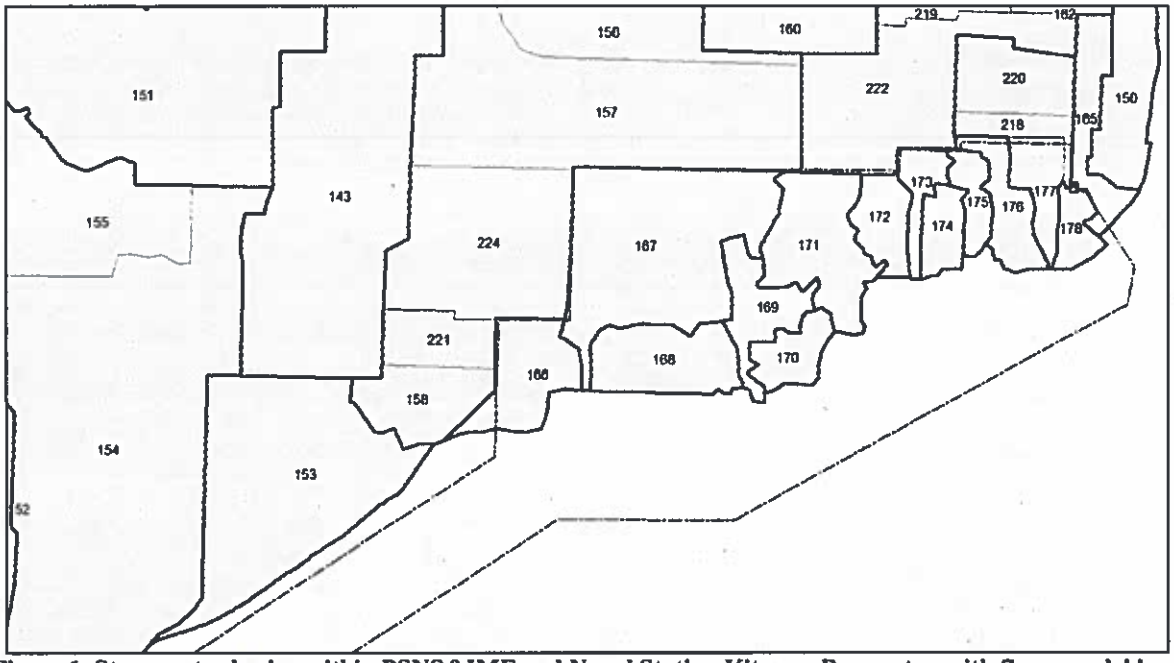


Figure 1. Stormwater basins within PSNS&IMF and Naval Station Kitsap – Bremerton with flows model by the HSPF model for Sinclair and Dyes Inlets (Skahill and LaHatte 2007).

The storm events sampled ranged from 0.24 – 0.84 in within a 24 hour period, which corresponded to small to medium storm events within the watershed (Brandenberger et al. 2007a,

b). The Cu concentration ranged from 21 – 191 ug/L and appeared to increase with storm events <0.6 inches of rain, but then decreased with storm events >0.6 inches of rain possibly indicating a "dilution effect" during large (>0.6 in) storm events (Brandenberger et al. 2007a,b). The copper concentrations for the unsampled basins (i.e. basins with n < 1 samples) were estimated based on the empirical data obtained from the sampled basins (Brandenberger et al. 2007b, Cullinan 2007).

The average daily flow for all the storm water basins at PSNS&IMF was about 0.34 Cubic Feet per Second (CFS, range 0.268- 0.396 CFS, Table 2) and resulted in about 63 – 93 million gallons per year (Table 3). The total amount of Cu released from storm water runoff from PSNS&IMF was estimated as 11.33 kg Cu/yr, with upper and lower quartiles of 7.24 - 17.16 kg/yr (Table 4), respectively. This represents a small fraction (<3.5%) of the Cu released from storm event runoff from the Sinclair and Dyes Inlets watershed which was estimated as 301 kg Cu for the wet season and 25 kg Cu for the dry season for an yearly average of 326 kg Cu/yr (Brandenberger et al. 2008).

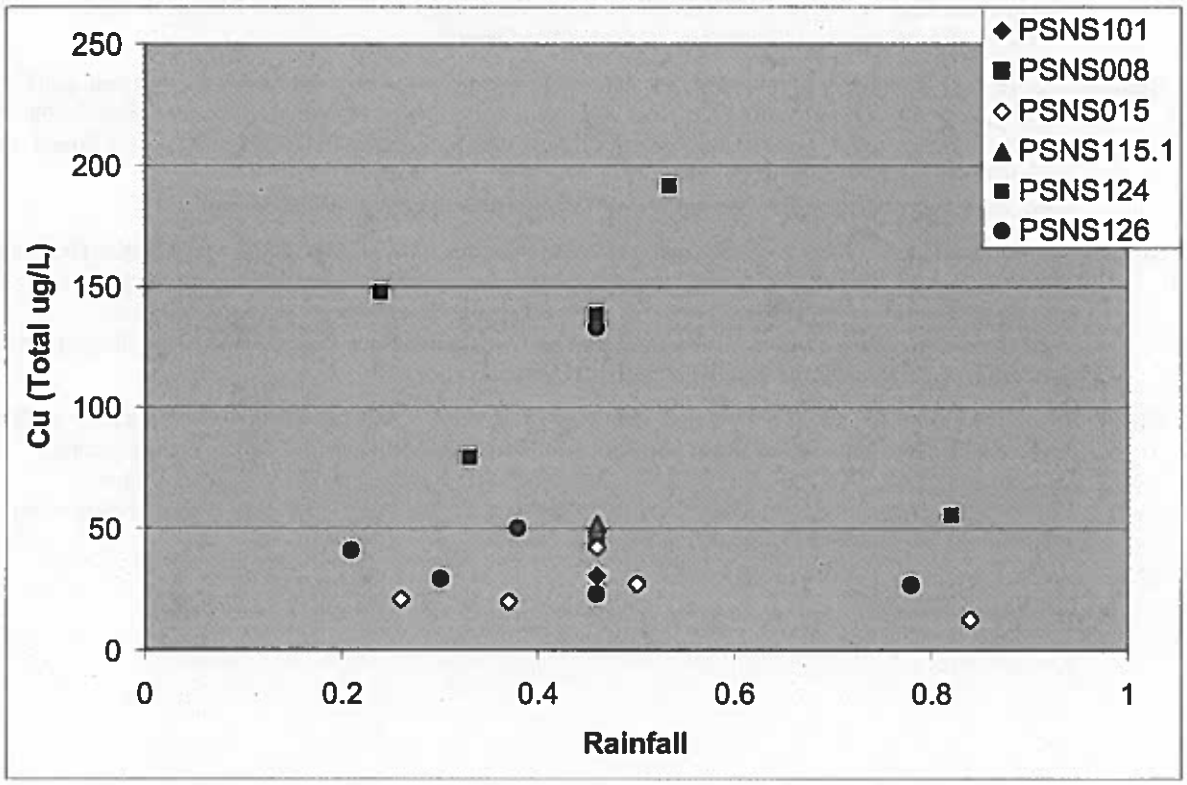


Figure 2. Relationship between Cu concentration and storm event size (inches of rain in 24 hr period) for storm water basins sampled at PSNS&IMF.

References:

Brandenberger, J. M., C.W. May, V.I Cullinan, R. K. Johnston, 2007a. Surface and Stormwater Quality Assessment for Sinclair and Dyes Inlet, Washington. June 2007, Prepared for the Puget Sound Naval Shipyard and Intermediate Maintenance Facility Project ENVVEST Bremerton, Washington, under Contract DE-AC06-76RLO 1830 Pacific Northwest National Laboratory Richland, Washington.

Brandenberger, Jill M., Chris May, and Valerie Cullinan Robert K. Johnston, Dwight E. Leisle, Bruce Beckwith, and Gerald Sherrell, David Metallo, and Ryan Pingree, 2007b. 2003-2005 Contaminant Concentrations in Storm Water from Sinclair/Dyes Inlet Watershed a Subasin of Puget Sound, WA, USA. Proceedings of the 2007 Georgia Basin Puget Sound Research Conference, Puget Sound Action Team and Environment Canada. http://www.engr.washington.edu/epp/psgb/2007psgb/2007proceedings/papers/9f_brand.pdf

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Cullinan,Valerie I., Christopher W. May, Jill M. Brandenberger, and Chaeli Judd, and Robert K. Johnston, 2007. Development Of An Empirical Water Quality Model For Stormwater Based on Watershed Land-Use in Puget Sound. Proceedings of the 2007 Georgia Basin Puget Sound Research Conference, Puget Sound Action Team and Environment Canada. http://www.engr.washington.edu/epp/psgb/2007psgb/2007proceedings/papers/5e_culli.pdf

Skahill, B.E., and LaHatte, C. 2006. Hydrological Simulation Program– Fortran Modeling of the Sinclair-Dyes Inlet Watershed for the Puget Sound Naval Shipyard & Intermediate Maintenance Facility Environmental Investment Project – FY 2006 REPORT. US Army Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS. Report to the US Navy Puget Sound Naval Shipyard and Intermediate Maintenance Facility Environmental Division.

Skahill, B.E., and LaHatte, C. 2007. Hydrological Simulation Program– Fortran Modeling of the Sinclair-Dyes Inlet Watershed for the Puget Sound Naval Shipyard & Intermediate Maintenance Facility Environmental Investment Project – FY 2007 REPORT. US Army Engineer Research and Development Center, Waterways Experiment Station, Vicksburg, MS. Report to the US Navy Puget Sound Naval Shipyard and Intermediate Maintenance Facility Environmental Division.

Table 1. Storm water samples collected from selected basins, date sample collected, total amount of rainfall during storm event sampled, and the event-mean concentration for total, dissolved, and particulate copper measured in the samples.

DSN	Station	Location	Date	rainfall in/24 hr	Total Cu ug/L	Dissolved Cu ug/L	Particulate Cu ug/L
166	PSNS008	Naval Station In-Active Ships	5/26/04	0.46	44.2	19.7	24.6
167	PSNS015	Naval Station McDonalds	4/19/04	0.26	21.1	7.1	14.0
167	PSNS015	Naval Station McDonalds	5/26/04	0.46	42.4	13.0	29.4
167	PSNS015	Naval Station McDonalds	10/18/04	0.50	27.3	5.1	22.3
167	PSNS015	Naval Station McDonalds	2/28/05	0.37	19.9	11.6	8.3
167	PSNS015	Naval Station McDonalds	3/19/05	0.84	12.8	5.8	7.1
174	PSNS101	PSNS Industrial (CIA)	5/26/04	0.46	30.8	17.1	13.7
175	PSNS115.1	PSNS Dry Dock	5/26/04	0.46	52.2	39.4	12.9
176	PSNS124	PSNS CIA Building 438 near Dry Dock #2	4/19/04	0.24	147.2	63.5	83.6
176	PSNS124	PSNS CIA Building 438 near Dry Dock #2	5/26/04	0.46	138.2	98.1	40.0
176	PSNS124	PSNS CIA Building 438 near Dry Dock #2	10/18/04	0.53	191.0	140.5	50.5
176	PSNS124	PSNS CIA Building 438 near Dry Dock #2	2/28/05	0.33	79.2	64.2	15.0
176	PSNS124	PSNS CIA Building 438 near Dry Dock #2	3/19/05	0.82	55.3	38.0	17.3
177	PSNS126	PSNS Downstream of CSO-16	4/19/04	0.21	40.9	27.6	13.3
177	PSNS126	PSNS Downstream of CSO-16	5/26/04	0.38	50.2	31.0	19.2
177	PSNS126	PSNS Downstream of CSO-16	5/26/04	0.46	132.7	98.6	34.1
177	PSNS126	PSNS Downstream of CSO-16	10/18/04	0.46	22.9	12.2	10.7
177	PSNS126	PSNS Downstream of CSO-16	2/28/05	0.30	29.2	23.0	6.2
177	PSNS126	PSNS Downstream of CSO-16	3/19/05	0.78	26.9	15.6	11.3

Table 2. The basin size and the average, lower quartile (25th percentile), and upper quartile (75th percentile) simulated yearly flow for each basin.

				DAILY FLOW (CFS)			
DSN No.	Basin Description/Location	WQ ID	Watershed Area (acres)	Yearly Average	Q1 25th Percentile	Q3 75th Percentile	Volume (L) per Year
166	PSNS008 Inactive Ships	PSNS008	30.0	0.023	0.018	0.028	20896202
167	PSNS015 McDonalds NavSta	PSNS015	101.2	0.077	0.063	0.090	69077615
168	PSNS FISC	PSNS052	32.7	0.034	0.027	0.040	30215875
169	PSNS081.1 Bldg 455 "R" St.	PSNS081	22.2	0.034	0.028	0.040	30597430
170	PSNS082.5 Bldg 480	PSNS082	14.6	0.010	0.008	0.012	9307496
171	PSNS DD5		42.6	0.033	0.026	0.040	29493357
172	PSNS Bldg 457		16.5	0.019	0.015	0.023	17121247
173	PSNS "N" St.		11.1	0.004	0.004	0.005	3945437
174	PSNS101 Pier 5	PSNS101	12.3	0.004	0.004	0.005	3945437
175	PSNS115.1 Dry Dock 1	PSNS115	10.6	0.004	0.003	0.005	3657241
176	PSNS124 Dry Dock 3/2	PSNS124	18.1	0.011	0.009	0.014	10256512
177[a]	PSNS126 Bldg 460 Pier 8	PSNS126	54.2	0.073	0.059	0.087	65570560
178	PSNS Main Gate		9.7	0.006	0.005	0.007	5233792
			375.8	0.335	0.268	0.396	299318200

a = Basin 177 includes City of Bremerton Park Ave (CSO16)

Table 3. The average, the lower quartile (25th percentile), and upper quartile (75th percentile) simulated yearly flow for each basin.

			Yearly Average		*Yearly (25th Percentile)*		*Yearly (75th Percentile)*	
DSN No.	Basin Description/Location	WQ ID	Gallons Per Day	MG/yr	Gallons Per Day	MG/yr	Gallons Per Day	MG/yr
166	PSNS008 Inactive Ships	PSNS008	15,124	5.52	11,731	4.28	18,097	6.61
167	PSNS015 McDonalds NavSta	PSNS015	49,996	18.25	41,009	14.97	58,395	21.31
168	PSNS FISC	PSNS052	21,869	7.98	17,160	6.26	26,144	9.54
169	PSNS081.1 Bldg 455 "R" St.	PSNS081	22,145	8.08	17,871	6.52	26,144	9.54
170	PSNS082.5 Bldg 480	PSNS082	6,736	2.46	5,426	1.98	7,982	2.91
171	PSNS DD5		21,346	7.79	16,643	6.07	25,530	9.32
172	PSNS Bldg 457		12,392	4.52	9,856	3.60	14,574	5.32
173	PSNS "N" St.		2,856	1.04	2,359	0.86	3,351	1.22
174	PSNS101 Pier 5	PSNS101	2,856	1.04	2,359	0.86	3,351	1.22
175	PSNS115.1 Dry Dock 1	PSNS115	2,647	0.97	2,149	0.78	3,070	1.12
176	PSNS124 Dry Dock 3/2	PSNS124	7,423	2.71	5,966	2.18	8,790	3.21
177[a]	PSNS126 Bldg 460 Pier 8	PSNS126	47,457	17.32	37,939	13.85	56,262	20.54
178	PSNS Main Gate		3,788	1.38	2,944	1.07	4,434	1.62
			216634	79	173410	63	256122	93

Table 4. The average, lower quartile (25th percentile), and upper quartile (75th percentile) estimated wet season Cu concentration and yearly load from each basin..

			Cu Concentration ug/L (Wet Season)				Copper Loading Kg/yr		
DSN No.	Basin Description/Location	WQ ID	Median	25th	75th	n*	Median	25th	75th
166	PSNS008 Inactive Ships	PSNS008	44.2	44.2	44.2	1	0.924	0.716	1.105
167	PSNS015 McDonalds NavSta	PSNS015	21.1	19.9	27.3	5	1.458	1.128	2.203
168	PSNS FISC	PSNS052	35.1	23.7	54.0	0	1.059	0.562	1.952
169	PSNS081.1 Bldg 455 "R" St.	PSNS081	59.4	58.5	60.2	2	1.817	1.445	2.175
170	PSNS082.5 Bldg 480	PSNS082	35.1	23.7	54.0	0	0.326	0.178	0.596
171	PSNS DD5		35.1	23.7	54.0	0	1.034	0.545	1.906
172	PSNS Bldg 457		35.1	23.7	54.0	0	0.600	0.323	1.088
173	PSNS "N" St.		35.1	23.7	54.0	0	0.138	0.077	0.250
174	PSNS101 Pier 5	PSNS101	30.8	30.8	30.8	1	0.121	0.100	0.142
175	PSNS115.1 Dry Dock 1	PSNS115	35.1	23.7	54.0	0	0.128	0.070	0.229
176	PSNS124 Dry Dock 3/2	PSNS124	138.2	79.2	147.2	5	1.417	0.653	1.787
177[a]	PSNS126 Bldg 460 Pier 8	PSNS126	35.1	27.5	47.9	6	2.298	1.440	3.722
178	PSNS Main Gate		1.1	1.1	1.1	1	0.006	0.004	0.006
							11.326	7.241	17.163

n* = Cu concentration based on observed data for n>1, estimated for n=0

Attachment 10: Non-Dry Dock Stormwater Cost Estimate

Puget Sound Naval Shipyard & Intermediate Maintenance Facility
AKART Study

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Total
Farragut North	74,361	67,627	94,834	31,930	47,558	369,758	0	0	686,069
Farragut South	72,289	30,069	21,543	87,819	59,291	120,490	52,557	79,567	523,626
Track Drains	647,031	769,768	924,376	848,412	1,691,039	2,689,777	0	0	7,570,403
Pier Drains	769,441	961,802	0	846,712	846,091	692,301	42,225	0	4,158,573
Equipment	21,747	28,137	16,817	21,747	21,747	28,137	40,147	40,147	218,627
Tanks	35,895	38,559	42,895	40,138	42,739	42,701	45,088	44,105	332,121
Total	1,620,766	1,895,963	1,100,465	1,876,759	2,708,466	3,943,164	180,018	163,819	13,489,420

NOTE: COST IS IN THOUSANDS

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 1	700	LF	$16,000	$11,200,000	$2,300	$1,610,000	$357	$250,040	$18,657	$13,060,040	$13,060	$15,672	$18,806	$22,568	$27,081	$32,498
	Install Common 24" Farragut Avenue Header	700	LF	$66	$46,074	$54	$37,800	$24	$17,080	$144	$100,954	$101	$121	$145	$174	$209	$251
	Resize/Align Farragut Tunnel Zone 1	700	LF	$35,000	$24,500,000	$3,246	$2,272,200	$226	$158,445	$38,472	$26,930,645	$26,931	$32,317	$38,780	$46,536	$55,843	$67,012
	Remove and Relocate Farragut Ave Duct Bank	700	LF	$16,000	$11,200,000	$6,223	$4,356,100	$357	$250,040	$22,580	$15,806,140	$15,806	$18,967	$22,761	$27,313	$32,776	$39,331
	Excavate and install new stormdrain piping																
	Excavate to install 6" pipe to connect B/55-1	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 6" pipe to connect B/55-1	100	LF	$14	$1,350	$16	$1,645	$117	$11,744	$147	$14,739	$15	$18	$21	$25	$31	$37
	Excavate to install 4" pipe to connect C/52-1 to C/52-2	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 4" pipe to connect C/52-1 to C/52-2	100	LF	$7	$720	$14	$1,400	$3	$288	$24	$2,408	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-7 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-7	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-8 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-8 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 50' of 8" pipe to connect E/53-2 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$18,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 50' of 8" pipe to connect E/53-2 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 6" pipe to connect E/54-1 to Header	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 6" pipe to connect E/54-1 to Header	100	LF	$14	$1,350	$16	$1,645	$4	$360	$34	$3,355	$3	$4	$5	$6	$7	$8
	Excavate to install 6" pipe to connect E/54-5 to Header	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 6" pipe to connect E/54-5 to Header	100	LF	$14	$1,350	$16	$1,645	$4	$360	$34	$3,355	$3	$4	$5	$6	$7	$8

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate stormdrain catchbasins E/54-5; 54-4, 54-3, 54-2, 53-6, 53-5,53-4, 52-10, 52-8,52-3,52-7,52-2, 52-6	13	LF	$8,000	$104,000	$5,600	$72,800	$357	$4,641	$13,957	$181,441	$181	$218	$261	$314	$378	$451
	Install new stormdrain catchbasins at E/54-5; 54-4, 54-3, 54-2, 53-6, 53-5,53-4, 52-10, 52-8,52-3,52-7,52-2, 52-6	13	LF	$8,000	$104,000	$5,600	$72,800	$357	$4,641	$13,957	$181,441	$181	$218	$261	$314	$378	$451
	Restore Farragut Zone 1 Paving	700	LF	$5,500	$3,850,000	$2,300	$1,610,000	$357	$0	$7,800	$5,460,000	$5,460	$6,552	$7,862	$9,435	$11,322	$13,586
	Farragut North Total											$74,361					$185,035
	Farragut South																
	Excavate Zone 1 waterfront to install 24" common drain line for Farragut South	1000	LF	$6,500	$6,500,000	$3,500	$3,500,000	$127	$126,510	$10,127	$10,126,510	$10,127	$12,152	$14,582	$17,499	$20,998	$25,198
	Install Common 24" Waterfront drain line	1000	LF	$66	$65,829	$54	$54,000	$24	$24,400	$144	$144,229	$144	$173	$208	$249	$299	$359
	Excavate to install 8" pipe to connect E/55-10 to E/54-9	150	LF	$16,000	$2,400,000	$2,300	$345,000	$357	$53,580	$18,657	$2,798,580	$2,799	$3,358	$4,030	$4,836	$5,803	$6,964
	Install new stormdrain 8" pipe to connect E/55-10 to E/54-9	150	LF	$22	$3,290	$18	$2,700	$117	$17,616	$157	$23,606	$24	$28	$34	$41	$49	$59
	Excavate to install 12" pipe from H/55-2 to I/55-28	400	LF	$16,000	$6,400,000	$2,300	$920,000	$5	$1,920	$18,305	$7,321,920	$7,322	$8,786	$10,544	$12,652	$15,183	$18,219
	Install new stormdrain piping 12" pipe from H/55-2 to I/55-28	400	LF	$27	$10,800	$33	$13,160	$7	$2,880	$67	$26,840	$27	$32	$39	$48	$56	$67
	Excavate stormdrain catchbasins I/55-28 & I/55-27 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Install new stormdrain catchbasins I/55-28 & I/55-27 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Excavate to install 24" pipe to the Treatment Plant	200	LF	$6,500	$1,300,000	$3,500	$700,000	$127	$25,302	$10,127	$2,025,302	$2,025	$2,430	$2,916	$3,500	$4,200	$5,040
	Install new stormdrain piping 24" pipe to the Treatment Plant	200	LF	$54	$10,800	$66	$13,164	$24	$4,880	$144	$28,844	$29	$35	$42	$50	$60	$72
	Excavate to install 24" pipefrom I/55-4 to common	400	LF	$16,000	$6,400,000	$2,300	$920,000	$83	$33,004	$18,383	$7,353,004	$7,353	$8,824	$10,588	$12,706	$15,247	$18,297
	Install new stormdrain piping 24" pipefrom I/55-4 to common	400	LF	$54	$21,600	$66	$26,328	$24	$9,760	$144	$57,688	$58	$69	$83	$100	$120	$144
	Excavate stormdrain catchbasins I/55-2,-7, I/55-8,-12,13,19,I/56-25,26 to support 24" lines	9	EA	$8,000	$72,000	$5,600	$50,400	$357	$3,213	$13,957	$125,613	$126	$151	$181	$217	$260	$313
	Install new stormdrain catchbasins I/55-2,-7, I/55-8,-12,13,19,I/56-25,26 to support 24" lines	9	EA	$8,000	$72,000	$5,600	$50,400	$357	$3,213	$13,957	$125,613	$126	$151	$181	$217	$260	$313

Zone 1

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate to install 24" pipe to connect G/55-4 to Treatment Plant	700	LF	$16,000	$11,200,000	$2,300	$1,610,000	$4	$2,520	$18,304	$12,812,520	$12,813	$15,375	$18,450	$22,140	$26,568	$31,882
	Install new stormdrain piping 24" pipe to connect G/55-4 to Treatment Plant	700	LF	$54	$37,800	$66	$46,074	$5	$3,360	$125	$87,234	$87	$105	$126	$151	$181	$217
	Excavate to install 6" pipe from H/54-12 to connect to Header	200	LF	$16,000	$3,200,000	$2,300	$460,000	$24	$4,880	$18,324	$3,664,880	$3,665	$4,398	$5,277	$6,333	$7,599	$9,119
	Install new stormdrain piping 6" pipe from H/54-12 to connect to Header	200	LF	$14	$2,700	$16	$3,290	$4	$720	$34	$6,710	$7	$8	$10	$12	$14	$17
	Excavate stormdrain catchbasins H/54-8 & H/54-9 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Install new stormdrain catchbasins H/54-8 & H/54-9 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Excavate to install 6" pipe to connect to Header	200	LF	$16,000	$3,200,000	$2,300	$460,000	$4	$720	$18,304	$3,660,720	$3,661	$4,393	$5,271	$6,326	$7,591	$9,109
	Install new stormdrain piping 6" pipe to connect to Header	200	LF	$14	$2,700	$16	$3,290	$4	$720	$34	$6,710	$7	$8	$10	$12	$14	$17
	Excavate stormdrain catchbasins H/54-11	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Install new stormdrain catchbasins at H/54-11	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Excavate stormdrain catchbasins I/54-4,54-7,54-11,-12,-13,-14, -15,-16, I/56-21	13	EA	$8,000	$104,000	$5,600	$72,800	$357	$4,641	$13,957	$181,441	$181	$218	$261	$314	$376	$451
	Excavate outfalls this zone	1700	LF	$9,200	$11,040,000	$8,300	$9,960,000	$453	$543,240	$17,953	$21,543,240	$21,543	$25,852	$31,022	$37,227	$44,672	$53,606
	Farragut South Total											$72,289					$179,877
	Zone 1 Farragut Total											$146,650					$364,912
	Zone 1 Crane/Train Tracks																
	Excavate Existing Crane Tracks and/or rail	1400	LF	$15,000	$21,000,000	$40,000	$56,000,000	$20,000	$28,000,000	$75,000	$105,000,000	$105,000	$126,000	$151,200	$181,440	$217,728	$261,274
	Install Trenches and Shoring	1400	LF	$15,000	$21,000,000	$25,000	$35,000,000	$29,000	$40,600,000	$69,000	$96,600,000	$96,600	$115,920	$139,104	$166,925	$200,310	$240,372
	Remove the existing catchbasins (unnumbered)	40	EA	$6,000	$240,000	$8,000	$320,000	$357	$14,288	$14,357	$574,288	$574	$689	$827	$992	$1,191	$1,429
	Install new 10" catchbasins	40	EA	$16,000	$640,000	$2,300	$92,000	$24	$976	$18,324	$732,976	$733	$880	$1,056	$1,267	$1,520	$1,824
	Install new 12" common header	1850	LF	$27	$49,950	$33	$60,865	$7	$13,320	$67	$124,135	$124	$149	$179	$215	$257	$309
	Replace crane/train rails and footing	1850	LF	$35,000	$64,750,000	$80,000	$148,000,000	$40,000	$74,000,000	$155,000	$286,750,000	$286,750	$344,100	$412,920	$495,504	$594,605	$713,526
	Load Testing and acceptance	1850	LF	$30,000	$55,500,000	$25,000	$46,250,000	$30,000	$55,500,000	$85,000	$157,250,000	$157,250	$188,700	$226,440	$271,728	$326,074	$391,288
	Zone 1 Crane/Train Track Total											$647,031					$1,610,021

Zone 1

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 1 Pier 6 Drains																
	Excavate Existing Crane Tracks and/or rail	2000	LF	$15,000	$30,000,000	$40,000	$80,000,000	$20,000	$40,000,000	$75,000	$150,000,000	$150,000	$180,000	$216,000	$259,200	$311,040	$373,248
	Install Trenches and Shoring	2000	LF	$15,000	$30,000,000	$25,000	$50,000,000	$29,000	$58,000,000	$69,000	$138,000,000	$138,000	$165,600	$198,720	$238,464	$286,157	$343,388
	Remove the existing catchbasins (unnumbered)	40	EA	$6,000	$240,000	$8,000	$320,000	$357	$14,288	$14,357	$574,288	$574	$689	$827	$992	$1,191	$1,429
	Install new 10" catchbasins	40	EA	$18,000	$640,000	$2,300	$92,000	$24	$976	$18,324	$732,976	$733	$880	$1,055	$1,267	$1,520	$1,824
	Install new 12" common header	2000	LF	$27	$54,000	$33	$65,800	$7	$14,400	$67	$134,200	$134	$161	$193	$232	$278	$334
	Replace crane/train rails and footing	2000	LF	$35,000	$70,000,000	$80,000	$160,000,000	$40,000	$80,000,000	$155,000	$310,000,000	$310,000	$372,000	$446,400	$535,680	$642,816	$771,379
	Load Testing and acceptance	2000	LF	$30,000	$60,000,000	$25,000	$50,000,000	$30,000	$60,000,000	$85,000	$170,000,000	$170,000	$204,000	$244,800	$293,760	$352,512	$423,014
	Zone 1 Pier 6 Drains Total											$769,441					$1,914,617
	Zone 1 Treatment Unit																
	3 MGD HRC Unit	1	Unit							$11,250,000	$11,250,000	$11,250	$13,500	$16,200	$19,440	$23,328	$27,994
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,163	$2,497,163	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 1 Treatment Total											$21,747					$54,114
	Zone 1 Tankage																
	Tank Foundation	1	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	1	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	1	EA	$153,050	$153,050	$76,550	$76,550	$0	$0	$229,600	$229,600	$230	$276	$331	$397	$476	$571
	Tank Level Indication	1	EA	$157,200	$157,200	$110,000	$110,000	$0	$0	$267,200	$267,200	$267	$321	$385	$462	$554	$665
	Manifolds	1	EA	$86,800	$86,800	$400,000	$400,000	$0	$0	$486,800	$486,800	$487	$584	$701	$841	$1,009	$1,211
	Sump Pumps	1	EA	$138,500	$138,500	$1,065,000	$1,065,000	$99,500	$99,500	$1,303,000	$1,303,000	$1,303	$1,564	$1,876	$2,252	$2,702	$3,242
	Booster Pumps	1	EA	$174,000	$174,000	$358,750	$358,750	$0	$0	$532,750	$532,750	$533	$639	$767	$921	$1,105	$1,326
	Mechanical/Electrical Hook-ups	1	EA	$113,000	$113,000	$163,000	$163,000	$0	$0	$276,000	$276,000	$276	$331	$397	$477	$572	$687
	Zone 1 Tankage Total											$35,895					$89,319
	Zone 1 Total (all elements)											$1,820,766					$4,032,983

Zone 2

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 2	700	LF	$16,000	$11,200,000	$2,300	$1,610,000	$357	$250,040	$18,657	$13,060,040	$13,060	$15,672	$18,806	$22,568	$27,081	$32,498
	Install Common 24" Farragut Avenue Header	700	LF	$66	$46,074	$54	$37,800	$24	$17,080	$144	$100,954	$101	$121	$145	$174	$209	$251
	Resize/Align Farragut Tunnel Zone 2	700	LF	$35,000	$24,500,000	$3,246	$2,272,200	$226	$158,445	$38,472	$26,930,645	$26,931	$32,317	$38,780	$46,536	$55,843	$67,012
	Remove and Relocate Farragut Ave Duct Bank	700	LF	$16,000	$11,200,000	$6,223	$4,356,100	$357	$250,040	$22,580	$15,806,140	$15,806	$18,967	$22,761	$27,313	$32,776	$39,331
	Excavate and Install new stormdrain piping																
	Excavate to install 8" pipe to connect E/52-7 to Header	200	LF	$16,000	$3,200,000	$2,300	$460,000	$83	$16,502	$18,383	$3,678,502	$3,677	$4,412	$5,294	$6,353	$7,624	$9,148
	Install new stormdrain piping 8" pipe to connect E/52-7	200	LF	$18	$3,600	$22	$4,386	$5	$960	$45	$8,946	$9	$11	$13	$15	$19	$22
	Excavate stormdrain catchbesins E/52-6,-49-9, 49-10	3	LF	$8,000	$24,000	$5,600	$16,800	$357	$1,071	$13,957	$41,871	$42	$50	$60	$72	$87	$104
	Install new stormdrain catchbesins at E/52-6,-49-9, 49-10	3	LF	$8,000	$24,000	$5,600	$16,800	$357	$1,071	$13,957	$41,871	$42	$50	$60	$72	$87	$104
	Restore Farragut Zone 2 Paving	700	LF	$5,500	$3,850,000	$2,300	$1,610,000	$357	$0	$7,800	$5,460,000	$5,460	$6,552	$7,862	$9,435	$11,322	$13,586
	Farragut North Total											$67,827					$168,278
	Farragut South																
	Excavate Zone 2 waterfront to install 24" common drain line for Farragut South	700	LF	$6,500	$4,550,000	$3,500	$2,450,000	$127	$88,557	$10,127	$7,088,557	$7,089	$8,506	$10,208	$12,249	$14,699	$17,639
	Install Common 24" Waterfront drain line	700	LF	$66	$46,074	$54	$37,800	$24	$17,080	$144	$100,954	$101	$121	$145	$174	$209	$251
	Excavate to install 10" pipe	400	LF	$16,000	$6,400,000	$2,300	$920,000	$357	$142,880	$18,657	$7,462,880	$7,463	$8,956	$10,747	$12,896	$15,475	$18,570
	Install new stormdrain 10" pipe	400	LF	$23	$27	$6	$2,400	$117	$46,976	$146	$49,403	$49	$59	$71	$85	$102	$123
	Excavate to install 10" pipe	800	LF	$16,000	$12,800,000	$2,300	$1,840,000	$5	$3,840	$18,305	$14,643,840	$14,644	$17,573	$21,087	$25,305	$30,365	$36,439
	Install new stormdrain piping 10" pipe	800	LF	$27	$21,600	$33	$26,320	$7	$5,760	$67	$53,680	$54	$64	$77	$93	$111	$134
	Excavate stormdrain catchbesins in front of Bldg 431	24	EA	$8,000	$192,000	$5,600	$134,400	$357	$8,568	$13,957	$334,968	$335	$402	$482	$579	$695	$834

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Install new stormdrain catchbasins to support 24" lines	24	EA	$8,000	$192,000	$5,600	$134,400	$357	$8,568	$13,957	$334,968	$335	$402	$482	$579	$695	$834
	Farragut South Total											$30,089					$74,822
	Zone 2 Farragut Total											$97,696					$243,099
	Zone 2 Crane/Train Tracks																
	Excavate Exsiting Crane Tracks and/or rail	2000	LF	$15,000	$30,000,000	$40,000	$80,000,000	$20,000	$40,000,000	$75,000	$150,000,000	$150,000	$180,000	$216,000	$259,200	$311,040	$373,248
	Install Trenches and Shoring	2000	LF	$15,000	$30,000,000	$25,000	$50,000,000	$29,000	$58,000,000	$69,000	$138,000,000	$138,000	$165,600	$198,720	$238,464	$286,157	$343,388
	Remove the exising catchbasins (unnumbered)	50	EA	$6,000	$300,000	$8,000	$400,000	$357	$17,860	$14,357	$717,860	$718	$861	$1,034	$1,240	$1,489	$1,786
	Install new 10" catchbasins	50	EA	$16,000	$800,000	$2,300	$115,000	$24	$1,220	$18,324	$916,220	$916	$1,099	$1,319	$1,583	$1,900	$2,280
	Install new 12" common header	2000	LF	$27	$54,000	$33	$65,800	$7	$14,400	$67	$134,200	$134	$161	$193	$232	$278	$334
	Replace crane/train rails and footing	2000	LF	$35,000	$70,000,000	$80,000	$160,000,000	$40,000	$80,000,000	$155,000	$310,000,000	$310,000	$372,000	$446,400	$535,680	$642,816	$771,379
	Load Testing and acceptance	2000	LF	$30,000	$60,000,000	$25,000	$50,000,000	$30,000	$60,000,000	$85,000	$170,000,000	$170,000	$204,000	$244,800	$293,760	$352,512	$423,014
	Zone 2 Crane/Train Track Total											$769,768					$1,915,430
	Zone 2 Pier 5 Drains																
	Excavate Exsiting Crane Tracks and/or rail	2500	LF	$15,000	$37,500,000	$40,000	$100,000,000	$20,000	$50,000,000	$75,000	$187,500,000	$187,500	$225,000	$270,000	$324,000	$388,800	$466,560
	Install Trenches and Shoring	2500	LF	$15,000	$37,500,000	$25,000	$62,500,000	$29,000	$72,500,000	$69,000	$172,500,000	$172,500	$207,000	$248,400	$298,080	$357,696	$429,235
	Remove the exising catchbasins (unnumbered)	50	EA	$6,000	$300,000	$8,000	$400,000	$357	$17,860	$14,357	$717,860	$718	$861	$1,034	$1,240	$1,489	$1,786
	Install new 10" catchbasins	50	EA	$16,000	$800,000	$2,300	$115,000	$24	$1,220	$18,324	$916,220	$916	$1,099	$1,319	$1,583	$1,900	$2,280
	Install new 12" common header	2500	LF	$27	$67,500	$33	$82,250	$7	$18,000	$67	$167,750	$168	$201	$242	$290	$348	$417
	Replace crane/train rails and footing	2500	LF	$35,000	$87,500,000	$80,000	$200,000,000	$40,000	$100,000,000	$155,000	$387,500,000	$387,500	$465,000	$558,000	$669,600	$803,520	$964,224
	Load Testing and acceptance	2500	LF	$30,000	$75,000,000	$25,000	$62,500,000	$30,000	$75,000,000	$85,000	$212,500,000	$212,500	$255,000	$306,000	$367,200	$440,640	$528,768
	Zone 2 Pier 5 Drains Total											$961,802					$2,393,271
	Zone 2 Treatment Unit																
	4 MGD HRC Unit	1	Unit							$17,640,000	$17,640,000	$17,640	$21,168	$25,402	$30,482	$36,578	$43,894
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,183	$2,497,183	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 2 Treatment Total											$28,137					$70,014

Zone 2

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 2 Tankage																
	Tank Foundation	1	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gal Storage in 1 Tank	1	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	1	EA	$153,050	$153,050	$76,550	$76,550	$0	$0	$229,600	$229,600	$230	$276	$331	$397	$476	$571
	Tank Level Indication	1	EA	$157,200	$157,200	$110,000	$110,000	$0	$0	$267,200	$267,200	$267	$321	$385	$462	$554	$665
	Mainfolds	1	EA	$86,600	$86,600	$400,000	$400,000	$0	$0	$486,600	$486,600	$487	$584	$701	$841	$1,009	$1,211
	Sump Pumps	2	EA	$138,500	$277,000	$1,065,000	$2,130,000	$99,500	$199,000	$1,303,000	$2,606,000	$2,606	$3,127	$3,753	$4,503	$5,404	$6,485
	Booster Pumps	2	EA	$174,000	$348,000	$358,750	$717,500	$0	$0	$532,750	$1,065,500	$1,066	$1,279	$1,534	$1,841	$2,209	$2,651
	Mechanical/Electrical Hook-ups	4	EA	$113,000	$452,000	$163,000	$652,000	$0	$0	$276,000	$1,104,000	$1,104	$1,325	$1,590	$1,908	$2,289	$2,747
	Zone 2 Tankage Total											$38,559					$95,947
	Zone 2 Total (all elements)											$1,895,963					$4,717,762

Zone 3

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 3	1000	LF	$16,000	$16,000,000	$2,300	$2,300,000	$357	$357,200	$375,500	$18,657,200	$18,657	$22,389	$26,866	$32,240	$38,688	$46,425
	Install Common 24" Farragut Avenue Header	1000	LF	$66	$65,820	$54	$54,000	$24	$24,400	$144	$144,220	$144	$173	$208	$249	$299	$359
	Resize/Align Farragut Tunnel Zone 3	1000	LF	$35,000	$35,000,000	$3,246	$3,246,000	$226	$226,350	$38,472	$38,472,350	$38,472	$46,167	$55,400	$66,480	$79,776	$95,732
	Remove and Relocate Farragut Ave Duct Bank	1000	LF	$16,000	$16,000,000	$6,223	$6,223,000	$357	$357,200	$22,580	$22,580,200	$22,580	$27,096	$32,515	$39,019	$46,822	$56,187
	Restore Farragut Zone 3 Paving	1600	LF	$5,500	$8,800,000	$2,300	$3,680,000	$357	$0	$7,800	$12,480,000	$12,480	$14,976	$17,971	$21,565	$25,879	$31,054
	Farragut North Total											$94,834					$235,977
	Farragut South																
	Install new stormdrain catchbasins at F/60-1 to support installation of 24" header	1	LF	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Excavate to install 24" pipe from F/60 to H/61	420	LF	$16,000	$6,720,000	$2,300	$966,000	$83	$34,654	$18,383	$7,720,654	$7,721	$9,265	$11,118	$13,341	$16,010	$19,211
	Install new stormdrain piping 24" pipe from F/60 to H/61	420	LF	$18	$7,560	$22	$9,211	$5	$2,016	$45	$18,787	$19	$23	$27	$32	$39	$47
	Install new stormdrain catchbasins to support installation of 24" header	3	LF	$8,000	$24,000	$5,600	$16,800	$357	$1,071	$13,957	$41,871	$42	$50	$60	$72	$87	$104
	Excavate outfall piping	120	LF	$16,000	$1,920,000	$2,300	$276,000	$83	$9,901	$18,383	$2,205,901	$2,206	$2,647	$3,176	$3,812	$4,574	$5,489
	Excavate to install 8" pipe from G/59-5 to H/59-2	200	LF	$16,000	$3,200,000	$2,300	$460,000	$83	$16,502	$18,383	$3,676,502	$3,677	$4,412	$5,294	$6,353	$7,624	$9,148
	Install new stormdrain piping 18" pipe from G/59-5 to H/59-2	200	LF	$41	$8,100	$48	$9,872	$11	$2,160	$101	$20,132	$20	$24	$29	$35	$42	$50
	Excavate to install 21" pipe from I/58-9 to outfall	240	LF	$16,000	$3,840,000	$2,300	$552,000	$4	$864	$18,304	$4,392,864	$4,393	$5,271	$6,326	$7,591	$9,109	$10,931
	Install new stormdrain piping 50' from I/58-9 to I/58-14	50	LF	$18	$900	$22	$1,097	$3	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 24" pipe from H/61-1 to I/58-14	500	LF	$16,000	$8,000,000	$2,300	$1,150,000	$4	$1,800	$18,304	$9,151,800	$9,152	$10,982	$13,179	$15,814	$18,977	$22,773
	Install new stormdrain piping 24" pipe from H/61-1 to I/58-14	500	LF	$14	$6,750	$18	$8,225	$4	$1,800	$34	$16,775	$17	$20	$24	$29	$35	$42

Zone 3

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Install new stormdrain manhole at H/60-6 and H/61-1 to support installation of 24" header	1	LF	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install new stormdrain catchbasin	1	LF	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install new stormdrain catchbasin E/58-7	1	LF	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Excavate to install 4" pipe to connect E/58-6 to E/58-7	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$18,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 4" pipe to connect E/58-6 to E/58-7	50	LF	$7	$360	$14	$708	$3	$144	$24	$1,212	$1	$1	$2	$2	$3	$3
	Excavate to install 6" pipe	250	LF	$16,000	$4,000,000	$2,300	$575,000	$4	$900	$18,304	$4,575,900	$4,576	$5,491	$6,589	$7,907	$9,489	$11,386
	Install new stormdrain piping	250	LF	$14	$3,375	$16	$4,113	$4	$900	$34	$8,388	$8	$10	$12	$14	$17	$21
	Excavate to install 6" pipe to be into 8" line.	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$18,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 6" pipe to be into 8" line.	50	LF	$14	$675	$16	$823	$4	$180	$34	$1,678	$2	$2	$2	$3	$3	$4
	Excavate to install 4" pipe to connect Header	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$18,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 4" pipe to connect Header	50	LF	$7	$360	$14	$708	$3	$144	$24	$1,212	$1	$1	$2	$2	$3	$3
	Excavate to install 6" pipe at H/57-5	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping at H/57-5	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate stormdrain catchbasins I/58-14, -13, 6, 5, I/57-6, 5, 9, and J/57-1, J/56-1 to support 8" line	10	LF	$8,000	$80,000	$5,600	$56,000	$357	$3,570	$13,957	$139,570	$140	$167	$201	$241	$289	$347
	Install new stormdrain catchbasins at I/58-14, -13, 6, 5, I/57-6, 5, 9, and J/57-1, J/56-1 to support 8" line	10	LF	$8,000	$80,000	$5,600	$56,000	$357	$3,570	$13,957	$139,570	$140	$167	$201	$241	$289	$347
	Excavation of Waterfront Zone 3 for Header South	580	LF	$16,000	$9,280,000	$2,300	$1,334,000	$357	$207,176	$225,476	$10,821,176	$10,821	$12,985	$15,582	$18,699	$22,439	$26,927
	Install Zone 3 24" common drain line for Waterfront Header	580	LF	$6,500	$3,770,000	$3,500	$2,030,000	$127	$73,376	$10,127	$5,873,376	$5,873	$7,048	$8,458	$10,149	$12,179	$14,615
	Excavate to install 4" pipe to connect I/58-5, I/58-6 and -6	90	LF	$16,000	$1,440,000	$2,300	$207,000	$4	$324	$18,304	$1,647,324	$1,647	$1,977	$2,372	$2,847	$3,416	$4,099
	Install new stormdrain piping 4" pipe to connect I/58-5, I/58-6 and -6	90	LF	$7	$648	$14	$1,274	$3	$259	$24	$2,181	$2	$3	$3	$4	$5	$5
	Excavate to install 6" pipe to be into I/57-5, -6, -1	330	LF	$16,000	$5,280,000	$2,300	$759,000	$4	$1,188	$18,304	$6,040,188	$6,040	$7,248	$8,698	$10,437	$12,525	$15,030
	Excavate for Waterfront Zone 3 for Header I/58-11 to -58-5	400	LF	$16,000	$6,400,000	$2,300	$920,000	$357	$142,680	$161,180	$7,462,680	$7,463	$8,955	$10,747	$12,896	$15,475	$18,570
	Install Waterfront Zone 3 for Header I/58-5 to I/58-11	400	LF	$66	$26,328	$54	$21,600	$24	$9,760	$144	$57,688	$58	$69	$83	$100	$120	$144
	Excavate to install 6" pipe to J/57 1 to J/57-3	600	LF	$16,000	$9,600,000	$2,300	$1,380,000	$4	$2,160	$18,304	$10,982,160	$10,982	$13,179	$15,814	$18,977	$22,773	$27,327
	Excavate to install 6" pipe J/57-5	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287

Zone 3

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate stormdrain catchbesins J/57-3, 57-4, 57-5 and replace to support 24" piping	3	LF	$8,000	$24,000	$5,600	$16,800	$357	$1,071	$13,957	$41,871	$42	$50	$60	$72	$87	$104
	Install Waterfront Zone 3 for Header J/56-1 to J/57-1	100	LF	$66	$6,582	$54	$5,400	$24	$2,440	$144	$14,422	$14	$17	$21	$25	$30	$36
	Excavate 10" line from J/56-1 to J/57-2,-57-6	200	LF	$16,000	$3,200,000	$2,300	$460,000	$83	$16,502	$18,383	$3,676,502	$3,677	$4,412	$5,294	$6,353	$7,624	$9,148
	Install Waterfront Zone 3 for Header J/57-2,57-6	600	LF	$66	$39,492	$54	$32,400	$24	$14,640	$144	$86,532	$87	$104	$125	$150	$179	$215
	Restore Farragut Zone 3 Paving	1600	LF	$5,500	$8,800,000	$2,300	$3,680,000	$357	$0	$7,800	$12,480,000	$12,480	$14,976	$17,971	$21,565	$25,879	$31,054
	Excavate outlets the zone	1200	LF	$9,200	$11,040,000	$8,300	$9,960,000	$453	$543,240	$17,953	$21,543,240	$21,543	$25,852	$31,022	$37,227	$44,672	$53,606
	Farragut South Total											$21,543					$292,344
	Zone 3 Farragut Total											$116,377					$528,321
	Zone 3 Crane/Train Tracks																
	Excavate Existing Crane Tracks and/or rail	2400	LF	$15,000	$36,000,000	$40,000	$96,000,000	$20,000	$48,000,000	$75,000	$180,000,000	$180,000	$216,000	$259,200	$311,040	$373,248	$447,898
	Install Trenches and Shoring	2400	LF	$15,000	$36,000,000	$25,000	$60,000,000	$29,000	$69,600,000	$69,000	$165,600,000	$165,600	$198,720	$238,464	$286,157	$343,388	$412,066
	Remove the exsiting catchbesins (unnumbered)	80	EA	$6,000	$480,000	$8,000	$640,000	$357	$28,576	$14,357	$1,148,576	$1,149	$1,378	$1,654	$1,985	$2,382	$2,858
	Install new 10" catchbesins	80	EA	$16,000	$1,280,000	$2,300	$184,000	$24	$1,952	$18,324	$1,465,952	$1,466	$1,759	$2,111	$2,533	$3,040	$3,648
	Install new 12" common header	2400	LF	$27	$64,800	$33	$78,960	$7	$17,280	$67	$161,040	$161	$193	$232	$278	$334	$401
	Replace crane/train rails and footing	2400	LF	$35,000	$84,000,000	$80,000	$192,000,000	$40,000	$96,000,000	$155,000	$372,000,000	$372,000	$446,400	$535,680	$642,816	$771,379	$925,655
	Load Testing and acceptance	2400	LF	$30,000	$72,000,000	$25,000	$60,000,000	$30,000	$72,000,000	$85,000	$204,000,000	$204,000	$244,800	$293,760	$352,512	$423,014	$507,617
	Zone 1 Crane/Train Track Total											$924,378					$2,300,142
	Zone 3 Pier 8 Drains																
	Pier Demolished FY09																
	Zone 3 Treatment Unit																
	2 MGD HRC Unit	1	Unit							$6,320,000	$6,320,000	$6,320	$7,584	$9,101	$10,921	$13,105	$15,726
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,163	$2,497,163	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 3 Treatment Total											$16,817					$41,846
	Zone 3 Tankage																

Zone 3

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Tank Foundation	1	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	1	Unit							$27,800,000	$27,800,000	$27,800	$33,360	$40,032	$48,038	$57,646	$69,175
	Misc Tank Fittings, Piping and Support	1	EA	$153,050	$153,050	$76,550	$76,550	$0	$0	$229,600	$229,600	$230	$276	$331	$397	$476	$571
	Tank Level Indication	1	EA	$157,200	$157,200	$110,000	$110,000	$0	$0	$267,200	$267,200	$267	$321	$385	$462	$554	$665
	Manifolds	1	EA	$86,800	$86,800	$400,000	$400,000	$0	$0	$486,800	$486,800	$487	$584	$701	$841	$1,009	$1,211
	Sump Pumps	1	EA	$138,500	$138,500	$1,065,000	$1,065,000	$99,500	$99,500	$1,303,000	$1,303,000	$1,303	$1,564	$1,876	$2,252	$2,702	$3,242
	Booster Pumps	1	EA	$174,000	$174,000	$358,750	$358,750	$0	$0	$532,750	$532,750	$533	$639	$767	$921	$1,105	$1,326
	Mechanical/Electrical Hook-ups	1	EA	$113,000	$113,000	$163,000	$163,000	$0	$0	$276,000	$276,000	$276	$331	$397	$477	$572	$687
	Zone 3 Tankage Total											$42,895					$106,737
	Zone 3 Total (all elements)											$1,100,485					$3,213,024

Zone 4

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 4	300	LF	$16,000	$4,800,000	$2,300	$690,000	$357	$107,160	$18,657	$5,597,160	$5,597	$6,717	$8,060	$9,672	$11,606	$13,928
	Install Common 24" Farragut Avenue Header	300	LF	$8,500	$1,950,000	$3,500	$1,050,000	$127	$37,953	$10,127	$3,037,953	$3,038	$3,646	$4,375	$5,250	$6,299	$7,559
	Resize/Align Farragut Tunnel Zone 4	300	LF	$35,000	$10,500,000	$3,246	$973,800	$226	$67,906	$38,472	$11,541,706	$11,542	$13,850	$16,620	$19,944	$23,933	$28,719
	Remove and Relocate Farragut Ave Duct Bank	300	LF	$16,000	$4,800,000	$6,223	$1,866,900	$357	$107,160	$22,580	$6,774,060	$6,774	$8,129	$9,755	$11,706	$14,047	$16,856
	Excavate and install new stormdrain piping																
	Excavate stormdrain catchbasins E/48-10, 6, 5, 3	5	LF	$8,000	$40,000	$5,600	$28,000	$357	$1,785	$13,957	$69,785	$70	$84	$100	$121	$145	$174
	Install new stormdrain catchbasins at E/48-10, 6, 5, 3 and stormdrain manhole	5	LF	$8,000	$40,000	$5,600	$28,000	$357	$1,785	$13,957	$69,785	$70	$84	$100	$121	$145	$174
	Restore Farragut Zone 4 Paving	300	LF	$5,500	$1,650,000	$2,300	$690,000	$357	$0	$7,800	$2,340,000	$2,340	$2,808	$3,370	$4,044	$4,852	$5,823
	Farragut North Total											$31,930					$79,453
	Farragut South																
	Excavate Catchbasin nest to support 24" lines	30	EA	$8,000	$240,000	$5,600	$168,000	$357	$10,710	$13,957	$418,710	$419	$502	$603	$724	$868	$1,042
	Install new stormdrain catchbasins to support 24" lines	30	EA	$8,000	$240,000	$5,600	$168,000	$357	$10,710	$13,957	$418,710	$419	$502	$603	$724	$868	$1,042
	Excavate to install 24" pipefrom I/55-4 to common	1100	LF	$16,000	$17,600,000	$2,300	$2,530,000	$83	$90,761	$18,383	$20,220,761	$20,221	$24,265	$29,118	$34,941	$41,930	$50,316
	Install new stormdrain piping 24" pipefrom I/55-4 to common	1100	LF	$54	$59,400	$66	$72,402	$24	$26,840	$144	$158,642	$159	$190	$228	$274	$329	$395
	Excavate to install 6" pipe from G/59-5 to H/59-2	1150	LF	$16,000	$18,400,000	$2,300	$2,645,000	$83	$94,887	$18,383	$21,139,887	$21,140	$25,368	$30,441	$36,530	$43,836	$52,603
	Install new stormdrain piping 18" pipe from G/59-5 to H/59-2	1150	LF	$41	$46,575	$49	$56,764	$11	$12,420	$101	$115,759	$116	$139	$167	$200	$240	$288
	Excavate stormdrain catchbasins I/51-1,2,6,7,11,12,14,15,18,19,22,23, 27,26	17	EA	$8,000	$136,000	$5,600	$95,200	$357	$6,069	$13,957	$237,269	$237	$285	$342	$410	$492	$590
	Install new stormdrain catchbasins I/51-1,2,6,7,11,12,14,15,18,19,22,23, 27,26	17	EA	$8,000	$136,000	$5,600	$95,200	$357	$6,069	$13,957	$237,269	$237	$285	$342	$410	$492	$590
	Excavate to install 6" pipe between J/49-6 & J/49-10	400	LF	$16,000	$6,400,000	$2,300	$920,000	$24	$9,760	$18,324	$7,329,760	$7,330	$8,796	$10,555	$12,666	$15,199	$18,239

Zone 4

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate outfalls this zone	400	LF	$9,200	$3,680,000	$8,300	$3,320,000	$453	$181,080	$17,953	$7,181,080	$7,181	$8,617	$10,341	$12,409	$14,891	$17,869
	Excavation of Zone 4 Quay Wall 694	300	LF	$26,000	$7,800,000	$63,000	$18,900,000	$457	$137,100	$89,457	$26,837,100	$26,837	$32,205	$38,645	$46,375	$55,649	$66,779
	Install Common 24" Zone 4 Quay Wall 694	300	LF	$6,500	$1,950,000	$3,500	$1,050,000	$127	$37,953	$10,127	$3,037,953	$3,038	$3,646	$4,375	$5,250	$6,299	$7,559
	Excavate MH J/49-10,K/49-1, J/50-4,K/50-4, K/50-2,-3, J/51-27,-28, J/51-4,-15	13	EA	$8,000	$104,000	$5,600	$72,800	$357	$4,644	$13,957	$181,444	$181	$218	$261	$314	$378	$451
	Install 24" MH	13	EA	$8,000	$104,000	$5,600	$72,800	$357	$4,644	$13,957	$181,444	$181	$218	$261	$314	$378	$451
	Plug Outfall line 017,098,099,100,099.1,101,100.1,102,102.1,103,104,105,106	13	EA	$8,000	$104,000	$1,150	$14,950	$357	$4,644	$9,507	$123,594	$124	$148	$178	$214	$256	$308
	Farragut South Total											$87,819					$142,974
	Zone 4 Farragut Total											$119,750					$222,427
	Zone 4 Crane/Train Tracks																
	Excavate Existing Crane Tracks and/or rail	2200	LF	$15,000	$33,000,000	$40,000	$88,000,000	$20,000	$44,000,000	$75,000	$165,000,000	$165,000	$198,000	$237,600	$285,120	$342,144	$410,573
	Install Trenches and Shoring	2200	LF	$15,000	$33,000,000	$25,000	$55,000,000	$29,000	$63,800,000	$69,000	$151,800,000	$151,800	$182,160	$218,592	$262,310	$314,772	$377,727
	Remove the existing catchbasins (unnumbered)	106	EA	$8,000	$636,000	$8,000	$848,000	$357	$37,863	$14,357	$1,521,863	$1,522	$1,826	$2,191	$2,630	$3,156	$3,787
	Install new 10" catchbasins	106	EA	$16,000	$1,696,000	$2,300	$243,800	$24	$2,586	$18,324	$1,942,386	$1,942	$2,331	$2,797	$3,356	$4,028	$4,833
	Install new 12" common header	2200	LF	$27	$59,400	$33	$72,380	$7	$15,840	$67	$147,620	$148	$177	$213	$256	$306	$367
	Replace crane/train rails and footing	2200	LF	$35,000	$77,000,000	$80,000	$176,000,000	$40,000	$88,000,000	$155,000	$341,000,000	$341,000	$409,200	$491,040	$589,248	$707,098	$848,517
	Load Testing and acceptance	2200	LF	$30,000	$66,000,000	$25,000	$55,000,000	$30,000	$66,000,000	$85,000	$187,000,000	$187,000	$224,400	$269,280	$323,136	$387,763	$465,316
	Zone 4 Crane/Train Track Total											$848,412					$2,111,120
	Zone 4 Pier 6 Drains																
	Excavate Existing Crane Tracks and/or rail	2200	LF	$15,000	$33,000,000	$40,000	$88,000,000	$20,000	$44,000,000	$75,000	$165,000,000	$165,000	$198,000	$237,600	$285,120	$342,144	$410,573
	Install Trenches and Shoring	2200	LF	$15,000	$33,000,000	$25,000	$55,000,000	$29,000	$63,800,000	$69,000	$151,800,000	$151,800	$182,160	$218,592	$262,310	$314,772	$377,727
	Remove the existing catchbasins (unnumbered)	54	EA	$6,000	$324,000	$8,000	$432,000	$357	$19,289	$14,357	$775,289	$775	$930	$1,116	$1,340	$1,608	$1,929
	Install new 10" catchbasins	54	EA	$16,000	$864,000	$2,300	$124,200	$24	$1,318	$18,324	$989,518	$990	$1,187	$1,425	$1,710	$2,052	$2,462
	Install new 12" common header	2200	LF	$27	$59,400	$33	$72,380	$7	$15,840	$67	$147,620	$148	$177	$213	$256	$306	$367
	Replace crane/train rails and footing	2200	LF	$35,000	$77,000,000	$80,000	$176,000,000	$40,000	$88,000,000	$155,000	$341,000,000	$341,000	$409,200	$491,040	$589,248	$707,098	$848,517
	Load Testing and acceptance	2200	LF	$30,000	$66,000,000	$25,000	$55,000,000	$30,000	$66,000,000	$85,000	$187,000,000	$187,000	$224,400	$269,280	$323,136	$387,763	$465,316
	Zone 4 Pier 6 Drains Total											$848,712					$2,106,891

Zone 4

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 4 Treatment Unit																
	3 MGD HRC Unit	1	Unit							$11,250,000	$11,250,000	$11,250	$13,500	$16,200	$19,440	$23,328	$27,994
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,183	$2,497,183	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 4 Treatment Total											$21,747					$54,114
	Zone 4 Tankage																
	Tank Foundation	1	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	1	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	1	EA	$153,050	$153,050	$76,550	$76,550	$0	$0	$229,600	$229,600	$230	$276	$331	$397	$476	$571
	Tank Level Indication	1	EA	$157,200	$157,200	$110,000	$110,000	$0	$0	$267,200	$267,200	$267	$321	$385	$462	$554	$665
	Manifolds	1	EA	$86,800	$86,800	$400,000	$400,000	$0	$0	$486,800	$486,800	$487	$584	$701	$841	$1,009	$1,211
	Sump Pumps	3	EA	$138,500	$415,500	$1,065,000	$3,195,000	$99,500	$298,500	$1,303,000	$3,909,000	$3,909	$4,691	$5,629	$6,755	$8,106	$9,727
	Booster Pumps	2	EA	$174,000	$348,000	$358,750	$717,500	$0	$0	$532,750	$1,065,500	$1,066	$1,279	$1,534	$1,841	$2,209	$2,651
	Mechanical/Electrical Hook-ups	5	EA	$113,000	$565,000	$163,000	$815,000	$0	$0	$276,000	$1,380,000	$1,380	$1,656	$1,987	$2,385	$2,862	$3,434
	Zone 4 Tankage Total											$40,138					$99,876
	Zone 4 Total (all elements)											$1,878,759					$4,594,429

Zone 5

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 5	300	LF	$16,000	$4,800,000	$2,300	$690,000	$357	$107,160	$18,657	$5,597,160	$5,597	$6,717	$8,060	$9,672	$11,606	$13,928
	Install Common 24" Farragut Avenue Header	300	LF	$6,500	$1,950,000	$3,500	$1,050,000	$127	$37,953	$10,127	$3,037,953	$3,038	$3,646	$4,375	$5,250	$6,299	$7,559
	Resize/Align Farragut Tunnel Zone 5	300	LF	$35,000	$10,500,000	$3,246	$973,800	$226	$67,905	$38,472	$11,541,705	$11,542	$13,850	$16,620	$19,944	$23,933	$28,719
	Remove and Relocate Farragut Ave Duct Bank	300	LF	$16,000	$4,800,000	$6,223	$1,866,900	$357	$107,160	$22,580	$6,774,060	$6,774	$8,129	$9,755	$11,706	$14,047	$16,856
	Excavate and Install new stormdrain piping																
	Excavate to install 6" pipe to connect B/55-1	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 6" pipe to connect B/55-1	100	LF	$14	$1,350	$16	$1,645	$117	$11,744	$147	$14,739	$15	$18	$21	$25	$31	$37
	Excavate to install 4" pipe to connect C/52-1 to C/52-2	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 4" pipe to connect C/52-1 to C/52-2	100	LF	$7	$720	$14	$1,400	$3	$288	$24	$2,408	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-7 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-7	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-8 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-8 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 50' of 8" pipe to connect E/53-2 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$18,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 50' of 8" pipe to connect E/53-2 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 6" pipe to connect E/54-1 to Header	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 6" pipe to connect E/54-1 to Header	100	LF	$14	$1,350	$16	$1,645	$4	$360	$34	$3,355	$3	$4	$5	$6	$7	$8
	Excavate to install 6" pipe between J/49-6 & J/49-10	400	LF	$16,000	$6,400,000	$2,300	$920,000	$4	$1,440	$18,304	$7,321,440	$7,321	$8,786	$10,543	$12,651	$15,182	$18,218
	Install new stormdrain piping 6" pipe between J/49-6 & J/49-10	400	LF	$14	$5,400	$16	$6,580	$4	$1,440	$34	$13,420	$13	$16	$19	$23	$28	$33
	Excavate stormdrain catchbasins E/48-10, 6, 5, 3	4	LF	$8,000	$32,000	$5,600	$22,400	$357	$1,428	$13,957	$55,828	$56	$67	$80	$96	$116	$139

Zone 5

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Install new stormdrain catchbasins at E/48-10, 6, 5, 3 and stormdrain manhole	5	LF	$8,000	$40,000	$5,600	$28,000	$357	$1,785	$13,957	$69,785	$70	$84	$100	$121	$145	$174
	Restore Farragut Zone 5 Paving	300	LF	$5,500	$1,650,000	$2,300	$690,000	$357	$0	$7,800	$2,340,000	$2,340	$2,808	$3,370	$4,044	$4,852	$5,823
	Farragut North Total											$47,558					$116,341
	Farragut South																
	Excavate Zone 5 waterfront to install 24" common drain line for Farragut South	4000	LF	$6,500	$26,000,000	$3,500	$14,000,000	$127	$506,040	$10,127	$40,506,040	$40,506	$48,607	$58,329	$69,994	$83,993	$100,792
	Install Common 24" Waterfront drain line	4000	LF	$66	$263,280	$54	$216,000	$24	$97,600	$144	$576,880	$577	$692	$831	$997	$1,196	$1,435
	Excavate stormdrain catchbasins I/S5-28 & I/S5-27 to support 24" lines	30	EA	$8,000	$240,000	$5,600	$168,000	$357	$10,710	$13,957	$418,710	$419	$502	$603	$724	$868	$1,042
	Install new stormdrain catchbasins I/S5-28 & I/S5-27 to support 24" lines	30	EA	$8,000	$240,000	$5,600	$168,000	$357	$10,710	$13,957	$418,710	$419	$502	$603	$724	$868	$1,042
	Excavate to install 24" pipefrom I/S5-4 to common	550	LF	$16,000	$8,800,000	$2,300	$1,265,000	$83	$45,381	$18,383	$10,110,381	$10,110	$12,132	$14,559	$17,471	$20,965	$25,158
	Install new stormdrain piping 24" pipefrom I/S5-4 to common	550	LF	$54	$29,700	$46	$36,201	$24	$13,420	$144	$79,321	$79	$95	$114	$137	$164	$197
	Excavate outfalls this zone	400	LF	$9,200	$3,680,000	$8,300	$3,320,000	$453	$181,080	$17,953	$7,181,080	$7,181	$8,617	$10,341	$12,409	$14,891	$17,869
	Farragut South Total											$59,291					$147,535
	Zone 5 Farragut Total											$106,850					$265,876
	Zone 5 Crane/Train Tracks																
	Excavate Existing Crane Tracks and/or rail	4400	LF	$15,000	$66,000,000	$40,000	$176,000,000	$20,000	$88,000,000	$75,000	$330,000,000	$330,000	$396,000	$475,200	$570,240	$684,288	$821,146
	Install Trenches and Shoring	4400	LF	$15,000	$66,000,000	$25,000	$110,000,000	$29,000	$127,600,000	$69,000	$303,600,000	$303,600	$364,320	$437,184	$524,621	$629,545	$755,454
	Remove the exsisng catchbasins (unnumbered)	35	EA	$6,000	$210,000	$8,000	$280,000	$357	$12,502	$14,357	$502,502	$503	$603	$724	$868	$1,042	$1,250
	Install new 10" catchbasins	35	EA	$16,000	$560,000	$2,300	$80,500	$24	$854	$18,324	$641,354	$641	$770	$924	$1,108	$1,330	$1,596
	Install new 12" common header	4400	LF	$27	$118,800	$33	$144,760	$7	$31,680	$67	$295,240	$295	$354	$425	$510	$612	$735
	Replace crane/tren rails and footing	4400	LF	$35,000	$154,000,000	$80,000	$352,000,000	$40,000	$176,000,000	$155,000	$682,000,000	$682,000	$818,400	$982,080	$1,178,496	$1,414,195	$1,697,034
	Load Testing and acceptance	4400	LF	$30,000	$132,000,000	$25,000	$110,000,000	$30,000	$132,000,000	$85,000	$374,000,000	$374,000	$448,800	$538,560	$646,272	$775,526	$930,632
	Zone 5 Crane/Train Track Total											$1,691,039					$4,207,846

Zone 5

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 5 Pier 3 Drains																
	Excavate Existing Crane Tracks and/or rail	2200	LF	$15,000	$33,000,000	$40,000	$88,000,000	$20,000	$44,000,000	$75,000	$165,000,000	$165,000	$198,000	$237,600	$285,120	$342,144	$410,573
	Install Trenches and Shoring	2200	LF	$15,000	$33,000,000	$25,000	$55,000,000	$29,000	$63,800,000	$69,000	$151,800,000	$151,800	$182,160	$218,592	$262,310	$314,772	$377,727
	Remove the existing catchbasins (unnumbered)	35	EA	$6,000	$210,000	$8,000	$280,000	$357	$12,502	$14,357	$502,502	$503	$603	$724	$868	$1,042	$1,250
	Install new 10" catchbasins	35	EA	$16,000	$560,000	$2,300	$80,500	$24	$854	$18,324	$641,354	$641	$770	$924	$1,108	$1,330	$1,596
	Install new 12" common header	2200	LF	$27	$59,400	$33	$72,380	$7	$15,840	$67	$147,620	$148	$177	$213	$255	$306	$367
	Replace crane/tram rails and footing	2200	LF	$35,000	$77,000,000	$80,000	$176,000,000	$40,000	$88,000,000	$155,000	$341,000,000	$341,000	$409,200	$491,040	$589,248	$707,098	$848,517
	Load Testing and acceptance	2200	LF	$30,000	$66,000,000	$25,000	$55,000,000	$30,000	$66,000,000	$85,000	$187,000,000	$187,000	$224,400	$269,280	$323,136	$387,763	$465,316
	Zone 5 Pier 6 Drains Total											$846,091					$2,105,346
	Zone 5 Treatment Unit																
	3 MGD HRC Unit	1	Unit							$11,250,000	$11,250,000	$11,250	$13,500	$16,200	$19,440	$23,328	$27,994
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,163	$2,497,163	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 5 Treatment Total											$21,747					$54,114
	Zone 5 Tankage																
	Tank Foundation	2	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	2	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	2	EA	$153,050	$306,100	$76,550	$153,100	$0	$0	$229,600	$459,200	$459	$551	$661	$793	$952	$1,143
	Tank Level Indication	2	EA	$157,200	$314,400	$110,000	$220,000	$0	$0	$267,200	$534,400	$534	$641	$770	$923	$1,108	$1,330
	Manifolds	2	EA	$86,800	$173,600	$400,000	$800,000	$0	$0	$486,800	$973,600	$974	$1,168	$1,402	$1,682	$2,019	$2,423
	Sump Pumps	3	EA	$138,500	$415,500	$1,065,000	$3,195,000	$99,500	$298,500	$1,303,000	$3,909,000	$3,909	$4,691	$5,629	$6,755	$8,106	$9,727
	Booster Pumps	4	EA	$174,000	$696,000	$358,750	$1,435,000	$0	$0	$532,750	$2,131,000	$2,131	$2,557	$3,069	$3,682	$4,419	$5,303
	Mechanical/Electrical Hook-ups	7	EA	$113,000	$791,000	$163,000	$1,141,000	$0	$0	$276,000	$1,932,000	$1,932	$2,318	$2,782	$3,338	$4,006	$4,807
	Zone 5 Tankage Total											$42,739					$106,349
	Zone 5 Total (all elements)											$2,708,466					$6,739,531

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Farragut North																
	Excavation of Farragut Avenue Zone 6	3600	LF	$16,000	$57,600,000	$2,300	$8,280,000	$357	$1,285,920	$18,657	$67,165,920	$67,166	$80,599	$96,719	$116,063	$139,275	$167,130
	Install Common 24" Farragut Avenue Header	3600	LF	$6,500	$23,400,000	$3,500	$12,600,000	$127	$455,436	$10,127	$36,455,436	$36,455	$43,747	$52,496	$62,995	$75,594	$90,713
	Resize/Align Farragut Tunnel Zone 6	3600	LF	$35,000	$126,000,000	$3,246	$11,685,600	$226	$814,860	$38,472	$138,500,460	$138,500	$166,201	$199,441	$239,329	$287,195	$344,633
	Remove and Relocate Farragut Ave Duct Bank	3600	LF	$16,000	$57,600,000	$6,223	$22,402,800	$357	$1,285,920	$22,580	$81,288,720	$81,289	$97,546	$117,056	$140,467	$168,560	$202,272
	Excavate and install new stormdrain piping																
	Excavate to install 6" pipe to connect B/55-1	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 6" pipe to connect B/55-1	100	LF	$14	$1,350	$15	$1,645	$117	$11,744	$147	$14,739	$15	$18	$21	$25	$31	$37
	Excavate to install 4" pipe to connect C/52-1 to C/52-2	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 4" pipe to connect C/52-1 to C/52-2	100	LF	$7	$720	$14	$1,400	$3	$288	$24	$2,408	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-7 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-7	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 8" pipe to connect E/52-8 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$83	$4,126	$18,383	$919,126	$919	$1,103	$1,324	$1,588	$1,906	$2,287
	Install new stormdrain piping 8" pipe to connect E/52-8 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 50' of 8" pipe to connect E/53-2 to Header	50	LF	$16,000	$800,000	$2,300	$115,000	$4	$180	$15,304	$915,180	$915	$1,098	$1,318	$1,581	$1,898	$2,277
	Install new stormdrain piping 50' of 8" pipe to connect E/53-2 to Header	50	LF	$18	$900	$22	$1,097	$5	$240	$45	$2,237	$2	$3	$3	$4	$5	$6
	Excavate to install 6" pipe to connect E/54-1 to Header	100	LF	$16,000	$1,600,000	$2,300	$230,000	$4	$360	$18,304	$1,830,360	$1,830	$2,196	$2,636	$3,163	$3,795	$4,555
	Install new stormdrain piping 6" pipe to connect E/54-1 to Header	100	LF	$14	$1,350	$16	$1,645	$4	$360	$34	$3,355	$3	$4	$5	$6	$7	$8
	Excavate to install 6" pipe between J/49-6 & J/49-10	400	LF	$16,000	$6,400,000	$2,300	$920,000	$4	$1,440	$18,304	$7,321,440	$7,321	$8,786	$10,543	$12,651	$15,182	$18,218
	Install new stormdrain piping 6" pipe between J/49-6 & J/49-10	400	LF	$14	$5,400	$16	$6,580	$4	$1,440	$34	$13,420	$13	$16	$19	$23	$28	$33
	Excavate stormdrain catchbasins E/48-10, 6, 5, 3	4	LF	$8,000	$32,000	$5,600	$22,400	$357	$1,428	$13,957	$55,828	$56	$67	$80	$96	$116	$139

Zone 6

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Install new stormdrain catchbasins at E/48-10, 6, 5, 3 and stormdrain manhole	5	LF	$8,000	$40,000	$5,600	$28,000	$357	$1,785	$13,957	$69,785	$70	$84	$100	$121	$145	$174
	Restore Farragut Zone 6 Paving	3600	LF	$5,500	$19,800,000	$2,300	$8,280,000	$357	$0	$7,800	$28,080,000	$28,080	$33,696	$40,435	$48,522	$58,227	$69,872
	Farragut North Total											$399,758					$920,078
	Farragut South																
	Excavate Zone 6 waterfront to install 24" common drain line for Farragut South	3600	LF	$6,500	$23,400,000	$3,500	$12,600,000	$127	$455,436	$10,127	$36,455,436	$36,455	$43,747	$52,496	$62,995	$75,594	$90,713
	Install Common 24" Waterfront drain line	3600	LF	$66	$236,952	$54	$194,400	$24	$87,840	$144	$519,192	$519	$623	$748	$897	$1,077	$1,292
	Excavate to install 8" pipe to connect E/55-10 to E/54-9	1150	LF	$16,000	$18,400,000	$2,300	$2,645,000	$357	$410,780	$18,657	$21,455,780	$21,456	$25,747	$30,896	$37,076	$44,491	$53,389
	Install new stormdrain 8" pipe to connect E/55-10 to E/54-9	1150	LF	$22	$25,220	$18	$20,700	$117	$135,056	$157	$180,976	$181	$217	$261	$313	$375	$450
	Excavate to install 12" pipe from H/55-2 to I/55-28	400	LF	$16,000	$6,400,000	$2,300	$920,000	$5	$1,920	$18,305	$7,321,920	$7,322	$8,786	$10,544	$12,652	$15,183	$18,219
	Install new stormdrain piping 12" pipe from H/55-2 to I/55-28	400	LF	$27	$10,800	$33	$13,160	$7	$2,880	$67	$26,840	$27	$32	$39	$46	$56	$67
	Excavate stormdrain catchbasins I/55-26 & I/55-27 to support 24" lines	30	EA	$8,000	$240,000	$5,600	$168,000	$357	$10,710	$13,957	$418,710	$419	$502	$603	$724	$869	$1,042
	Install new stormdrain catchbasins I/55-26 & I/55-27 to support 24" lines	4	EA	$8,000	$32,000	$5,600	$22,400	$357	$1,428	$13,957	$55,828	$56	$67	$80	$96	$116	$139
	Excavate to install 24" pipe to the Treatment Plant	200	LF	$6,500	$1,300,000	$3,500	$700,000	$127	$25,302	$10,127	$2,025,302	$2,025	$2,430	$2,916	$3,500	$4,200	$5,040
	Install new stormdrain piping 24" pipe to the Treatment Plant	200	LF	$54	$10,800	$66	$13,164	$24	$4,880	$144	$28,844	$29	$35	$42	$50	$60	$72
	Excavate to install 24" pipefrom I/55-4 to common	1100	LF	$16,000	$17,600,000	$2,300	$2,530,000	$83	$90,761	$18,383	$20,220,761	$20,221	$24,265	$29,118	$34,941	$41,930	$50,316
	Install new stormdrain piping 24" pipefrom I/55-4 to common	1100	LF	$54	$59,400	$66	$72,402	$24	$26,840	$144	$158,642	$159	$190	$228	$274	$329	$395
	Excavate stormdrain catchbasins I/55-2,-7, I/55-8,-12,13,19,I/56-25,26 to support 24" lines	14	EA	$8,000	$112,000	$5,600	$78,400	$357	$4,998	$13,957	$195,398	$195	$234	$281	$338	$405	$486
	Install new stormdrain catchbasins I/55-2,-7, I/55-8,-12,13,19,I/56-25,26 to support 24" lines	3	EA	$8,000	$24,000	$5,600	$16,800	$357	$1,071	$13,957	$41,871	$42	$50	$60	$72	$87	$104
	Excavate to install 24" pipe to connect G/55-4 to Treatment Plant	700	LF	$16,000	$11,200,000	$2,300	$1,610,000	$4	$2,520	$18,304	$12,812,520	$12,813	$15,375	$18,450	$22,140	$26,568	$31,882
	Install new stormdrain piping 24" pipe to connect G/55-4 to Treatment Plant	700	LF	$54	$37,800	$66	$46,074	$5	$3,360	$125	$87,234	$87	$105	$126	$151	$181	$217

Zone 6

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate to install 6" pipe between J/49-6 & J/49-10	400	LF	$16,000	$6,400,000	$2,300	$920,000	$24	$9,760	$18,324	$7,329,760	$7,330	$8,796	$10,555	$12,666	$15,199	$18,239
	Install new stormdrain piping 6" pipe between J/49-6 & J/49-10	400	LF	$14	$5,400	$16	$6,580	$4	$1,440	$34	$13,420	$13	$16	$19	$23	$28	$33
	Excavate stormdrain catchbasins H/54-8 & H/54-9 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Install new stormdrain catchbasins H/54-8 & H/54-9 to support 24" lines	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Excavate to install 6" pipe to connect to Header	200	LF	$16,000	$3,200,000	$2,300	$460,000	$4	$720	$18,304	$3,660,720	$3,661	$4,393	$5,271	$6,326	$7,591	$9,109
	Install new stormdrain piping 6" pipe to connect to Header	200	LF	$14	$2,700	$16	$3,290	$4	$720	$34	$6,710	$7	$8	$10	$12	$14	$17
	Excavate stormdrain catchbasins H/54-11	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Install new stormdrain catchbasins at H/54-11	2	EA	$8,000	$16,000	$5,600	$11,200	$357	$714	$13,957	$27,914	$28	$33	$40	$48	$58	$69
	Excavate stormdrain catchbasins I/54-4,54-7,54-11,-12,-13,-14, -15,-16, I/56-21	13	EA	$8,000	$104,000	$5,600	$72,800	$357	$4,641	$13,957	$181,441	$181	$218	$261	$314	$376	$451
	Excavate outfalls this zone	400	LF	$9,200	$3,680,000	$8,300	$3,320,000	$453	$181,080	$17,953	$7,181,080	$7,181	$8,617	$10,341	$12,409	$14,891	$17,869
	Farragut South Total											$120,490					$299,818
	Zone 6 Farragut Total											$490,248					$1,219,894
	Zone 6 Crane/Train Tracks																
	Excavate Existing Crane Tracks and/or rail	7000	LF	$15,000	$105,000,000	$40,000	$280,000,000	$20,000	$140,000,000	$75,000	$525,000,000	$525,000	$630,000	$756,000	$907,200	$1,088,640	$1,306,368
	Install Trenches and Shoring	7000	LF	$15,000	$105,000,000	$25,000	$175,000,000	$29,000	$203,000,000	$69,000	$483,000,000	$483,000	$579,600	$695,520	$834,624	$1,001,549	$1,201,859
	Remove the existing catchbasins (unnumbered)	40	EA	$6,000	$240,000	$8,000	$320,000	$357	$14,288	$14,357	$574,288	$574	$689	$827	$992	$1,191	$1,429
	Install new 10" catchbasins	40	EA	$16,000	$640,000	$2,300	$92,000	$24	$976	$18,324	$732,976	$733	$880	$1,055	$1,267	$1,520	$1,824
	Install new 12" common header	7000	LF	$27	$189,000	$33	$230,300	$7	$50,400	$67	$469,700	$470	$564	$676	$812	$974	$1,169
	Replace crane/train rails and footing	7000	LF	$35,000	$245,000,000	$80,000	$560,000,000	$40,000	$280,000,000	$155,000	$1,085,000,000	$1,085,000	$1,302,000	$1,562,400	$1,874,880	$2,249,856	$2,699,827
	Load Testing and acceptance	7000	LF	$30,000	$210,000,000	$25,000	$175,000,000	$30,000	$210,000,000	$85,000	$595,000,000	$595,000	$714,000	$856,800	$1,028,160	$1,233,792	$1,480,550
	Zone 6 Crane/Train Track Total											$2,689,777					$6,693,029
	Zone 6 Pier 6 Drains																
	Excavate Existing Crane Tracks and/or rail	1800	LF	$15,000	$27,000,000	$40,000	$72,000,000	$20,000	$36,000,000	$75,000	$135,000,000	$135,000	$162,000	$194,400	$233,280	$279,936	$335,923
	Install Trenches and Shoring	1800	LF	$15,000	$27,000,000	$25,000	$45,000,000	$29,000	$52,200,000	$69,000	$124,200,000	$124,200	$149,040	$178,848	$214,618	$257,541	$309,049
	Remove the existing catchbasins (unnumbered)	30	EA	$6,000	$180,000	$8,000	$240,000	$357	$10,716	$14,357	$430,716	$431	$517	$620	$744	$893	$1,072

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Install new 10" catchbasins	30	EA	$16,000	$480,000	$2,300	$69,000	$24	$732	$18,324	$549,732	$550	$660	$792	$950	$1,140	$1,368
	Install new 12" common header	1800	LF	$27	$48,600	$33	$59,220	$7	$12,960	$67	$120,780	$121	$145	$174	$209	$250	$301
	Replace crane/train rails and footing	1800	LF	$35,000	$63,000,000	$80,000	$144,000,000	$40,000	$72,000,000	$155,000	$279,000,000	$279,000	$334,800	$401,760	$482,112	$578,534	$694,241
	Load Testing and acceptance	1800	LF	$30,000	$54,000,000	$25,000	$45,000,000	$30,000	$54,000,000	$85,000	$153,000,000	$153,000	$183,600	$220,320	$264,384	$317,261	$380,713
	Zone 6 Pier 6 Drains Total											$692,301					$1,722,667
	Zone 6 Treatment Unit																
	4 MGD HRC Unit	1	Unit							$17,640,000	$17,640,000	$17,640	$21,168	$25,402	$30,482	$36,578	$43,894
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,183	$2,497,183	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 6 Treatment Total											$28,137					$70,014
	Zone 6 Tankage																
	Tank Foundation	2	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	2	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	2	EA	$153,050	$306,100	$76,550	$153,100	$0	$0	$229,600	$459,200	$459	$551	$661	$793	$952	$1,143
	Tank Level Indication	2	EA	$157,200	$314,400	$110,000	$220,000	$0	$0	$267,200	$534,400	$534	$641	$770	$923	$1,108	$1,330
	Manifolds	2	EA	$86,800	$173,600	$400,000	$800,000	$0	$0	$486,800	$973,600	$974	$1,168	$1,402	$1,682	$2,019	$2,423
	Sump Pumps	4	EA	$138,500	$554,000	$1,065,000	$4,260,000	$99,500	$398,000	$1,303,000	$5,212,000	$5,212	$6,254	$7,505	$9,006	$10,808	$12,969
	Booster Pumps	2	EA	$174,000	$348,000	$358,750	$717,500	$0	$0	$532,750	$1,065,500	$1,066	$1,279	$1,534	$1,841	$2,209	$2,651
	Mechanical/Electrical Hook-ups	6	EA	$113,000	$678,000	$163,000	$978,000	$0	$0	$276,000	$1,656,000	$1,656	$1,987	$2,385	$2,862	$3,434	$4,121
	Zone 6 Tankage Total											$42,701					$106,253
	Zone 6 Total (+8 elements)											$3,943,164					$9,811,854

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Zone 7 Decatur South																
	Excavation of Decatur Avenue Zone 7	1600	LF	$16,000	$25,600,000	$2,300	$3,680,000	$357	$571,520	$18,657	$29,851,520	$29,852	$35,822	$42,986	$51,583	$61,900	$74,280
	Install Common 24" Decatur Avenue Header	1600	LF	$68	$108,312	$54	$86,400	$24	$39,040	$144	$230,752	$231	$277	$332	$399	$478	$574
	Excavate MH R/30-14	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 017	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Excavate MH R/31-4	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 017 1, 018, 019, 020	4	EA	$8,000	$32,000	$1,150	$4,600	$357	$1,429	$9,507	$38,029	$38	$46	$55	$66	$79	$95
	Excavate MH R/32-2	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line020 1,021,022,023	4	EA	$8,000	$32,000	$1,150	$4,600	$357	$1,429	$9,507	$38,029	$38	$46	$55	$66	$79	$95
	Excavate MH R/33-1	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 024, 025	2	EA	$8,000	$16,000	$1,150	$2,300	$357	$714	$9,507	$19,014	$19	$23	$27	$33	$39	$47
	Excavate MH R/33-5	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 026,027,028,029	4	EA	$8,000	$32,000	$1,150	$4,600	$357	$1,429	$9,507	$38,029	$38	$46	$55	$66	$79	$95
	Excavate MH R/34-4	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 030	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Excavate MH R/34-6	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 031	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Excavate MH R/34-15	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 032, 033, 034, 035, 036	5	EA	$8,000	$40,000	$1,150	$5,750	$357	$1,786	$9,507	$47,536	$48	$57	$68	$82	$99	$118
	Excavate MH R/35-8	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 037, 038, 039, 040, 041, 042	6	EA	$8,000	$48,000	$1,150	$6,900	$357	$2,143	$9,507	$57,043	$57	$68	$82	$99	$118	$142
	Excavate MH R/36-6	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 043, 044	2	EA	$8,000	$16,000	$1,150	$2,300	$357	$714	$9,507	$19,014	$19	$23	$27	$33	$39	$47
	Excavate MH R/37-5	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 0045, 046, 047, 048, 049, 050, 051, 052	8	EA	$8,000	$64,000	$1,150	$9,200	$357	$2,858	$9,507	$76,058	$76	$91	$110	$131	$158	$189
	Excavate MH R/37-6	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 24" MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line 053	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Excavate stormdrain catchbasins R35-6, 35-3, 35-1, 34-19, 34-16, 34-17, 34-11, 34-8, 32-5, 35-3, 35-6, 35-7, 36-1, 36-2, 36-4, 36-7, 35-5, 37-3, 37-2, 37-1, 37-4	22	LF	$8,000	$176,000	$5,600	$123,200	$357	$7,854	$13,957	$307,054	$307	$368	$442	$531	$637	$764
	Install new stormdrain catchbasins at R35-6, 35-3, 35-1, 34-19, 34-16, 34-17, 34-11, 34-8, 32-5, 35-3, 35-6, 35-7, 36-1, 36-2, 36-4, 36-7, 35-5, 37-3, 37-2, 37-1, 37-4	22	LF	$8,000	$176,000	$5,600	$123,200	$357	$7,854	$13,957	$307,054	$307	$368	$442	$531	$637	$764
	Excavate to install 8" pipe to connect Q31-2 to R/31-3	100	LF	$16,000	$1,600,000	$2,300	$230,000	$83	$8,251	$18,383	$1,838,251	$1,838	$2,206	$2,647	$3,176	$3,812	$4,574
	Install new stormdrain piping 8" pipe to connect Q31-2 to R/31-3	100	LF	$18	$1,800	$22	$2,193	$5	$480	$45	$4,473	$4	$5	$6	$8	$9	$11
	Excavate to install 6" pipe to connect N34-4 to N/34-5	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 6" pipe to connect N34-4 to N/34-5	100	LF	$14	$1,350	$16	$1,645	$117	$11,744	$147	$14,739	$15	$18	$21	$25	$31	$37
	Excavate to install 6" pipe from O/36-4 to O/36-7 and O/36-7 to O/37-11	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 6" pipe from O/36-4 to O/36-7 and O/36-7 to O/37-11	100	LF	$14	$1,350	$16	$1,645	$117	$11,744	$147	$14,739	$15	$18	$21	$25	$31	$37
	Restore Decatur South Zone 7 Paving	1600	LF	$5,500	$8,800,000	$2,300	$3,680,000	$357	$571,520	$8,157	$13,051,520	$13,052	$15,662	$18,794	$22,553	$27,064	$32,476
	Decatur South Total											$52,557					$130,779
	Zone 7 Decatur Total											$52,557					$130,779
	Zone 7 Crane/Train Tracks																
	No Crane rails in this area																
	Zone 7 Pier C Drains																
	Install Trenches and Shoring	600	LF	$15,000	$9,000,000	$25,000	$15,000,000	$29,000	$17,400,000	$69,000	$41,400,000	$41,400	$49,680	$59,616	$71,539	$85,847	$103,016
	Remove the existing catchbasins (unnumbered)	24	EA	$6,000	$144,000	$8,000	$192,000	$357	$8,573	$14,357	$344,573	$345	$413	$496	$595	$715	$857
	Install new 10" catchbasins	24	EA	$16,000	$384,000	$2,300	$55,200	$24	$586	$18,324	$439,786	$440	$528	$633	$760	$912	$1,094
	Install new 12" common header	600	LF	$27	$16,200	$33	$19,740	$7	$4,320	$67	$40,260	$40	$48	$58	$70	$83	$100
	Zone 7 Pier C Drains Total											$42,225					$105,068

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 7 Treatment Unit																
	5 MGD HRC Unit	1	Unit							$29,650,000	$29,650,000	$29,650	$35,580	$42,696	$51,235	$61,482	$73,779
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,183	$2,497,183	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 7 Treatment Total											$40,147					$99,899
	Zone 7 Tankage																
	Tank Foundation	2	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	2	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	2	EA	$153,050	$306,100	$76,550	$153,100	$0	$0	$229,600	$459,200	$459	$551	$661	$793	$952	$1,143
	Tank Level Indication	2	EA	$157,200	$314,400	$110,000	$220,000	$0	$0	$267,200	$534,400	$534	$641	$770	$923	$1,108	$1,330
	Manifolds	2	EA	$86,800	$173,600	$400,000	$800,000	$0	$0	$486,800	$973,600	$974	$1,168	$1,402	$1,682	$2,019	$2,423
	Sump Pumps	5	EA	$138,500	$692,500	$1,065,000	$5,325,000	$99,500	$497,500	$1,303,000	$6,515,000	$6,515	$7,818	$9,382	$11,258	$13,510	$16,211
	Booster Pumps	3	EA	$174,000	$522,000	$358,750	$1,076,250	$0	$0	$532,750	$1,598,250	$1,598	$1,918	$2,301	$2,762	$3,314	$3,977
	Mechanical/Electrical Hook-ups	8	EA	$113,000	$904,000	$163,000	$1,304,000	$0	$0	$276,000	$2,208,000	$2,208	$2,650	$3,180	$3,815	$4,579	$5,494
	Zone 7 Tankage Total											$45,068					$112,194
	Zone 7 Total (all elements)											$180,918					$447,941

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Mobilization										$2,500,000	$2,500	$3,000	$3,600	$4,320	$5,184	$6,221
	Zone 8 Charleston South																
	Excavation of Charleston Avenue Zone 8	1600	LF	$16,000	$25,600,000	$2,300	$3,680,000	$357	$571,520	$18,657	$29,851,520	$29,852	$35,822	$42,986	$51,583	$61,900	$74,280
	Install Common 54" Charleston Avenue Header	1600	LF	$122	$194,400	$148	$236,960	$55	$87,824	$324	$519,184	$519	$623	$748	$897	$1,077	$1,292
	Excavation of Charleston Avenue Zone 8 48"	1000	LF	$16,000	$16,000,000	$2,300	$2,300,000	$357	$357,200	$18,657	$18,657,200	$18,657	$22,389	$26,866	$32,240	$38,688	$46,425
	Install Common 48" Charleston Avenue Header	1000	LF	$108	$108,000	$132	$131,650	$49	$48,790	$288	$288,440	$288	$346	$415	$498	$598	$718
	Excavate to install 12" pipe to connect S/23-1	300	LF	$16,000	$4,800,000	$2,300	$690,000	$357	$107,160	$18,657	$5,597,160	$5,597	$6,717	$8,060	$9,672	$11,606	$13,928
	Install new stormdrain 12" pipe to connect S/23-1	300	LF	$27	$8,100	$33	$9,870	$67	$20,130	$127	$38,100	$38	$46	$55	$66	$79	$95
	Excavate MH T/24-2	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Install 8' MH	1	EA	$8,000	$8,000	$5,600	$5,600	$357	$357	$13,957	$13,957	$14	$17	$20	$24	$29	$35
	Plug Outfall line	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Excavate Catchbasins T/24-2, 24 1, 23-6, 23-5, 23-7	5	EA	$8,000	$40,000	$5,600	$28,000	$357	$1,786	$13,957	$69,786	$70	$84	$100	$121	$145	$174
	Connect T-23 into new Header and plug	50	LF	$27	$1,350	$33	$1,645	$7	$360	$67	$3,355	$3	$4	$5	$6	$7	$8
	Excavate to install 8" pipe to connect B-1	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 8" pipe to connect B-1	100	LF	$18	$1,800	$22	$2,193	$117	$11,744	$157	$15,737	$16	$19	$23	$27	$33	$39
	Install Catchbasin B-1 and Slope toward the plant	1	EA	$8,000	$8,000	$1,150	$1,150	$5	$5	$9,155	$9,155	$9	$11	$13	$16	$19	$23
	Excavate 150' from outfall 005	150	LF	$16,000	$2,400,000	$2,300	$345,000	$357	$53,580	$18,657	$2,798,580	$2,799	$3,358	$4,030	$4,836	$5,803	$6,964
	Excavate to install 8" pipe to connect U/25-1	100	LF	$16,000	$1,600,000	$2,300	$230,000	$357	$35,720	$18,657	$1,865,720	$1,866	$2,239	$2,687	$3,224	$3,869	$4,643
	Install new stormdrain 8" pipe to connect U/25-1	100	LF	$18	$1,800	$22	$2,193	$117	$11,744	$157	$15,737	$16	$19	$23	$27	$33	$39
	Plug Outfall line 006	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Plug Outfall line 008	1	EA	$8,000	$8,000	$1,150	$1,150	$357	$357	$9,507	$9,507	$10	$11	$14	$16	$20	$24
	Excavate to install 42" pipe from T/25-10 to T/25-14	125	LF	$16,000	$2,000,000	$2,300	$287,500	$357	$44,650	$18,657	$2,332,150	$2,332	$2,799	$3,358	$4,030	$4,836	$5,803
	Install new stormdrain from T/25-10 to T/25-14	125	LF	$95	$11,813	$115	$14,368	$43	$5,370	$253	$31,580	$32	$38	$45	$55	$65	$79
	Restore Decatur South Zone 8 Paving	1600	LF	$5,500	$8,800,000	$2,300	$3,680,000	$357	$571,520	$8,157	$13,051,520	$13,052	$15,662	$18,794	$22,553	$27,064	$32,476
	Decatur South Total											$79,567					$197,986

Item Number	Description	Number	Unit	Labor Unit Cost	Total	Material Unit Cost	Total	Equipment Unit Cost	Total	Unit Cost	Total	Rounded (000)	2010	2011	2012	2013	2014
	Zone 8 Decatur Total											$79,567					$197,063
	Zone 8 Crane/Train Tracks																
	No Crane rails in this area																
	Zone 8 Pier Drains																
	No Pier in this area																
	Zone 8 Treatment Unit																
	5 MGD HRC Unit	1	Unit							$29,650,000	$29,650,000	$29,650	$35,580	$42,696	$51,235	$61,482	$73,779
	Foundation	1	Unit							$8,000,000	$8,000,000	$8,000	$9,600	$11,520	$13,824	$16,589	$19,907
	Utilities	1	Unit							$2,497,163	$2,497,163	$2,497	$2,997	$3,596	$4,315	$5,178	$6,214
	Zone 8 Treatment Total											$40,147					$99,899
	Zone 8 Tankage																
	Tank Foundation	1	Unit							$12,000,000	$12,000,000	$12,000	$14,400	$17,280	$20,736	$24,883	$29,860
	1M Gall Storage in 1 Tank	1	Unit							$20,800,000	$20,800,000	$20,800	$24,960	$29,952	$35,942	$43,131	$51,757
	Misc Tank Fittings, Piping and Support	1	EA	$153,050	$153,050	$76,550	$76,550	$0	$0	$229,600	$229,600	$230	$276	$331	$397	$476	$571
	Tank Level Indication	1	EA	$157,200	$157,200	$110,000	$110,000	$0	$0	$267,200	$267,200	$267	$321	$385	$462	$554	$665
	Manifolds	1	EA	$86,800	$86,800	$400,000	$400,000	$0	$0	$486,800	$486,800	$487	$584	$701	$841	$1,009	$1,211
	Sump Pumps	5	EA	$138,500	$692,500	$1,065,000	$5,325,000	$99,500	$497,500	$1,303,000	$6,515,000	$6,515	$7,818	$9,382	$11,258	$13,510	$16,211
	Booster Pumps	3	EA	$174,000	$522,000	$358,750	$1,076,250	$0	$0	$532,750	$1,598,250	$1,598	$1,918	$2,301	$2,762	$3,314	$3,977
	Mechanical/Electrical Hook-ups	8	EA	$113,000	$904,000	$163,000	$1,304,000	$0	$0	$276,000	$2,208,000	$2,208	$2,650	$3,180	$3,815	$4,579	$5,494
	Zone 8 Tankage Total											$44,105					$109,747
	Zone 8 Total (all elements)											$183,819					$407,634
	GRAND TOTAL																$20,144,783